

**UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY**

HYDROLOGIC MONITORING OF A WASTE-INJECTION WELL

NEAR MILTON, FLORIDA, JUNE 1975 - JUNE 1977

By C. A. Pascale and J. B. Martin

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ABSTRACT

This report presents the hydraulic and chemical data collected from June 1, 1975, when injection began, to June 30, 1977 through a monitoring program at a deep-well waste-injection system at the American Cyanamid Company's plant near Milton, about 12 miles northwest of Pensacola. The injection system consists of a primary injection well, a standby injection well, and two deep monitor wells all completed open hole in the lower limestone of the Floridan aquifer and one shallow-monitor well completed in the upper limestone of the Floridan aquifer. Two of the monitor wells and the standby injection well are used to observe hydraulic and geochemical effects of waste injection in the injection zone at locations 8,180 feet northeast, 1,560 feet south, and 1,025 feet southwest of the primary injection well. The shallow-monitor well, used to observe any effects in the first permeable zone above the 200-foot-thick confining bed, is 28 feet north of the primary injection well.

Since injection began in June 1975, 607 million gallons of treated industrial liquid waste with a pH of 4.6 to 6.3 and containing high concentrations of nitrate, organic nitrogen and carbon have been injected into a saline-water-filled limestone aquifer. Wellhead pressure at the injection well in June 1977 averaged 137 pounds per square inch and the hydraulic pressure gradient was 0.53 pound per square inch per foot of depth to the top of the injection zone. Water levels rose from 36 to 74 feet at the three wells used to monitor the injection zone during the 25-month period. The water level in the shallow-monitor well declined about 8 feet. No changes were detected in the chemical character of water from the shallow-monitor well and deep-monitor well-north. Increases in concentration of bicarbonate and dissolved organic carbon were detected in water from the deep-test monitor well in February 1976 and at the standby injection well in August 1976. In addition to increases in bicarbonate and dissolved organic carbon, sulfate, total organic nitrogen, and total nitrogen concentrations have also increased substantially in samples from these wells. Nitrogen gas concentrations in water samples collected at the three deep-monitor wells ranged from 19 to 176 milligrams per liter, methane from 4.5 to 11.4 milligrams per liter, and carbon dioxide from 7.7 to 44 milligrams per liter. The most probable number of denitrifying bacteria in water samples collected at the three deep-monitor wells ranged from less than 2 colonies to 17 colonies per 100 milliliters.

None of the water samples collected in April 1977 at the three deep-monitor wells showed positive concentrations of acetone, ethanol, methanol, or acrylonitrile.

INTRODUCTION

Purpose and Scope

The purpose of this report is to present the hydraulic and chemical data collected through a monitoring program conducted by the U.S. Geological Survey at a industrial liquid-waste injection site 6 mi southwest of Milton in Santa Rosa County. The injection system is also briefly described. The monitoring program began June 1, 1975, is in cooperation with the Bureau of Water Resources Management of the Florida Department of Environmental Regulation, and is supported by the American Cyanamid Co., owner of the injection system.

The data are presented in graphs and tables. These data include injection rates, volumes, and pressures; water-level data at three monitor wells and a standby injection well, and field and laboratory analyses of water samples from the four wells.

Acknowledgments

The generous cooperation of American Cyanamid Co. in permitting access to the injection site and furnishing technical data about their injection facility is acknowledged.

Injection

At the American Cyanamid Co.'s plant site, the liquid waste is injected into the saline-water-filled lower limestone of the Floridan aquifer, which is overlain by the widespread Bucatunna Clay Member of the Byram Formation, a clay confining bed. Overlying this 200-ft-thick confining bed is the upper limestone of the Floridan aquifer (Musgrove, Barraclough, and Marsh, 1961, p. 17). The upper limestone contains freshwater at the injection site.

Underground injection of waste at American Cyanamid Co. began June 1, 1975. The waste is injected through the primary injection well at a depth between about 1,340 and 1,530 ft below land surface. The treated waste, with a pH of 4.6 to 6.3, contains high concentrations of nitrate, organic nitrogen, and carbon.

For use of those readers who may prefer to use metric units rather than English units, the conversion factors for the terms used in this report are listed below:

<u>Multiply English units</u>	<u>By</u>	<u>To obtain metric units</u>
inches (in)	25.4	millimeters (mm)
feet (ft)	.3048	meters (m)
miles (mi)	1.609	kilometers (km)
gallons (gal)	3.785	liters (L)
	3.785×10^{-3}	cubic meters (m ³)
gallons per minute (gal/min)	.6309	liters per second (L/s)
pounds per square inch (lb/in ²)	.07031	kilograms per square centimeter (kg/cm ²)

THE MONITORING PROGRAM

Objectives

The purpose of the monitoring program is to observe the effects of waste injection on the injection zone and to determine whether the injected waste moves within the injection zone and does not leak upward through the confining bed to contaminate shallower brackish and fresh ground water. Further, the monitoring program is a source of hydrologic and geochemical data for research investigations to predict the ultimate regional effects of the waste injection.

Description of the Injection System

The American Cyanamid Co.'s waste-injection system consists of a primary and a standby injection well, two deep-monitor wells referred to as the deep-monitor well-north and the deep-test monitor well, and one shallow-monitor well. Location of the wells is shown on figure 1. A brief summary of the physical characteristics of the wells comprising the injection system are listed on the next page. The construction and testing details of the well system are described by Pascale (1975).

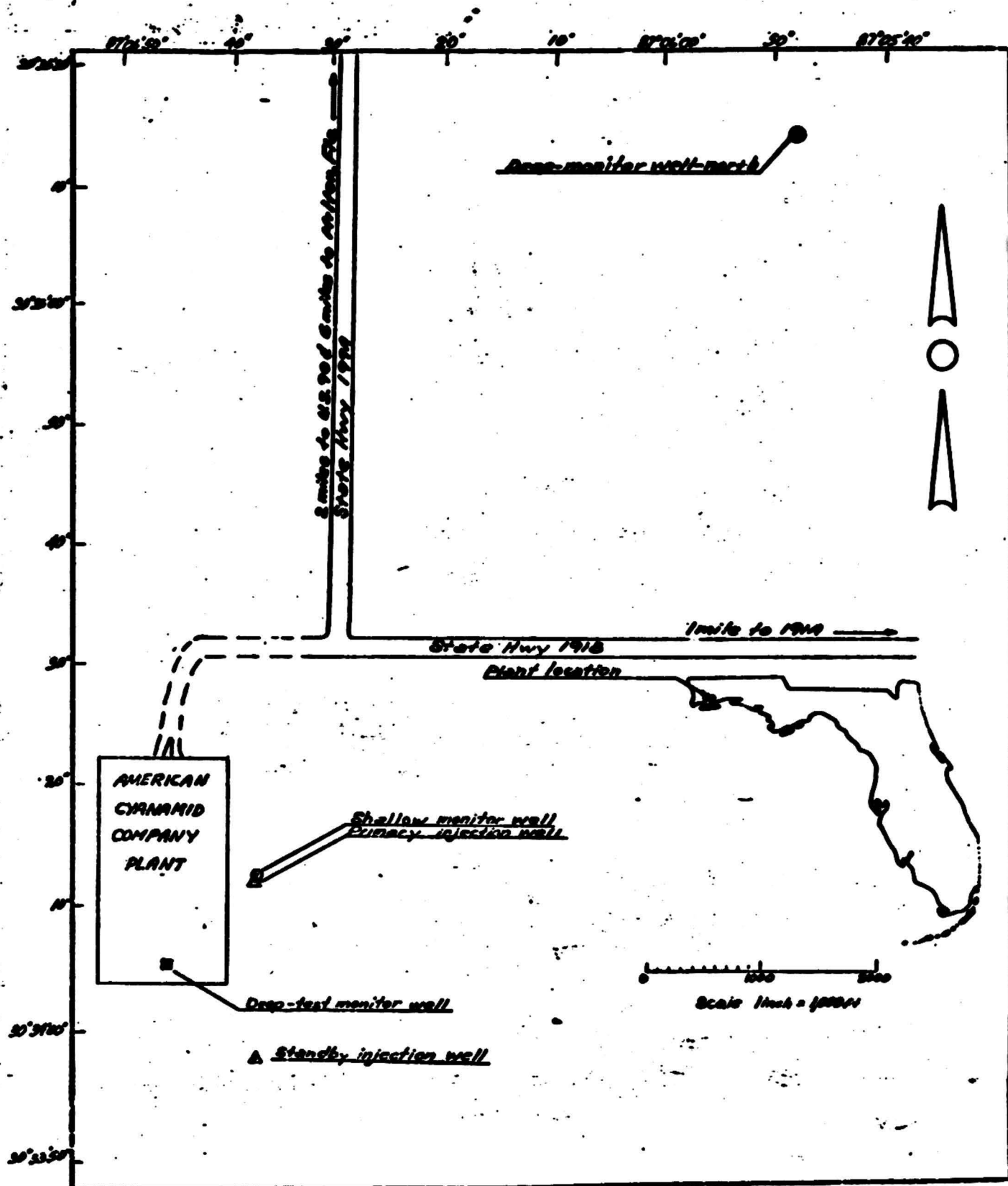


Figure 1.—Location of the injection site and monitor wells.

Well name	Latitude and longitude	Altitude of land surface (ft)	Well completion date	Depth of well below land surface (ft)	Casing record ^{1/} (ft)
Primary injection well	30°34'13"N 87°06'38"W	108	Nov. 1974	1,526	24-in steel, 0-100 16-in steel, 0-870 12-in steel, 0-1,318 12-in stainless steel, 1,318-1,338 8-in stainless steel liner, 0-1,338
Standby injection well	30°33'57"N 87°06'38"W	68	Dec. 1974	1,508	24-in steel, 0-100 16-in steel, 0-863 12-in steel, 0-1,300 12-in stainless steel, 1,300-1,320 8-in stainless steel liner, 0-1,320
Deep-test monitor well	30°34'05"N 87°06'46"W	102	Dec. 1971	1,546	18-in steel, 0-103 12-in steel, 0-881 6-in steel, 0-1,444 ^{2/} 6-in stainless steel, 1,444-1,464
Deep-monitor well-north	30°35'14"N 87°05'48"W	122	Dec. 1974	1,492	6-in steel, 0-1,276
Shallow-monitor well	30°34'13"N 87°06'38"W	109	Nov. 1974	1,108	6-in steel, 0-1,096

^{1/}All but one well cased into top of lower limestone of Floridan aquifer; shallow monitor cased to near bottom of upper limestone of the Floridan aquifer.

^{2/}Perforated 1,340 to 1,440 ft.

The two injection wells and two deep-monitor wells are completed open hole in the lower limestone of the Floridan aquifer, the injection zone. At this time (1977), only the primary injection well is used for waste injection; the standby injection well is used as an additional deep-monitor well. The standby injection well, deep-monitor well-north, and the deep-test monitor well provide a means to observe hydraulic and geochemical effects of waste injection in the injection zone at locations 1,560 ft south, 8,180 ft northeast, and 1,025 ft southwest of the primary injection well, respectively.

The deep-test monitor well was drilled and tested in 1971 to determine if hydrogeologic conditions were favorable for deep-well waste disposal of liquid waste. After completing the tests, the well was converted to a monitor well by perforating the casing within the interval 1,340-1,440 ft, to open the well to the full thickness of the injection zone. The deep-monitor well-north was drilled to monitor the regional pressure effects of the injection system and to serve in early surveillance of waste movement northward.

The shallow-monitor well, 28 ft north of the primary injection well, was drilled into the upper limestone of the Floridan aquifer specifically to monitor the integrity of the 200-ft-thick confining bed directly overlying the injection zone. It was drilled to the top of the confining bed and cased with 6-in casing to within 12 ft of the top of the confining bed. The shallow-monitor well provides a means to observe hydraulic and geochemical changes in the first permeable zone above the confining bed.

Data Collection

Injection rates, wellhead injection pressures, and wellhead pressures in the monitor wells are measured continuously by means of recorders. Water samples collected monthly from the monitor wells are analyzed for pH, bicarbonate, temperature, conductance, nitrogen, phosphorus, calcium, chloride, fluoride, magnesium, sulfate, and dissolved organic carbon. Samples collected semiannually are analyzed for boron, copper, cyanide, iron, zinc, and all major cations and anions. Samples are collected intermittently for the determination of gases and bacteria.

HYDRAULIC AND CHEMICAL DATA

Injection Pressures and Rates

During the 25-month period, June 1, 1975 through June 30, 1977, the monthly average wellhead pressure at the primary injection well ranged from 72 lb/in² at an injection rate of 513 gal/min in June 1975 to 137 lb/in² at 633 gal/min in June 1977 as shown in figure 2. The maximum wellhead injection pressure and corresponding injection rate for any one day was 172 lb/in² and 842 gal/min. No waste was injected on 35 days scattered throughout the period.

The injection rate during June 1977 averaged 633 gal/min and the wellhead pressure at the primary injection well averaged 137 lb/in². After correcting for head loss due to friction, the hydraulic pressure gradient was calculated at 0.53 lb/in² per foot of depth to the top of the injection zone. The aggregate volume of waste injected through June 1977, shown in figure 3, is 607 million gallons.

Injection Index

The injection index is a measure of the ability of the well to accept waste: the higher the injection index, the lower the pressure required to inject waste at a given rate. It is defined as the injection rate per change in bottom-hole pressure, or:

$$I = \frac{\text{Injection Rate (gal/min)}}{\Delta P \text{ (lb/in}^2\text{)}}$$

where ΔP is the bottom-hole pressure increase. The monthly average injection index (I) through June 1977 ranged from 5.3 to 8.7 [(gal/min)/lb/in²] as shown in figure 4.

MONTHLY AVERAGE VELOCITY PRESSURE,
IN POUNDS PER SQUARE INCH

MONTHLY AVERAGE INJECTION
RATE, L.1 GALLONS PER MINUTE

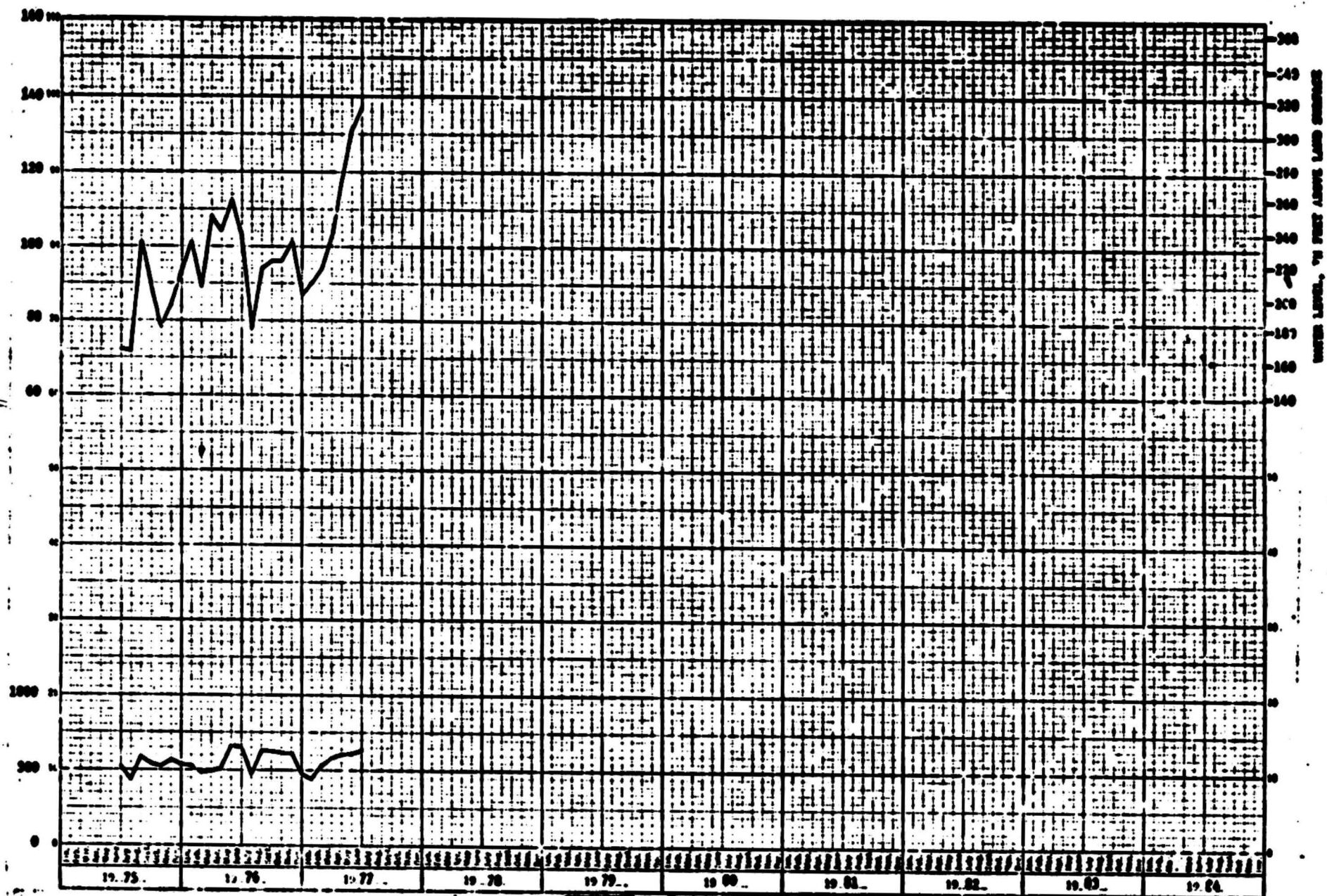


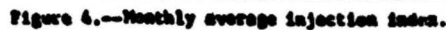
Figure 2.--Hydrographs of monthly average injection pressure and injection rates.

67 2739



Figure 3.--Graph of cumulative volume of waste injected.

CONTINENTAL ADVANCE INJECTION TOOL, 1"



Water-Level Changes at the Monitor Wells

Water-level data for the three monitor wells and the standby injection well are shown on the hydrograph in figure 5, in terms of feet above or below land surface and wellhead pressure, and in greater detail in figures 6-9. The water level in the shallow-monitor well declined from about 62 ft below land surface in June 1975 to about 70 ft below in June 1977.

Water-level changes beginning in June 1975 are shown in figures 5 and 7-9 for the three wells used to monitor the injection zone. Since June 1975, the water level has increased by about 74, 65, and 36 ft at the standby injection, deep-test monitor, and deep-monitor well-north wells. The fluctuations in water levels at the standby injection and deep-test monitor wells (fig. 7-8) parallel the fluctuations in the daily average injection rate, which can range from zero on several consecutive days to more than 870 gal/min.

WELLHEAD PRESSURE, IN POUNDS PER SQUARE INCH AT LAND SURFACES

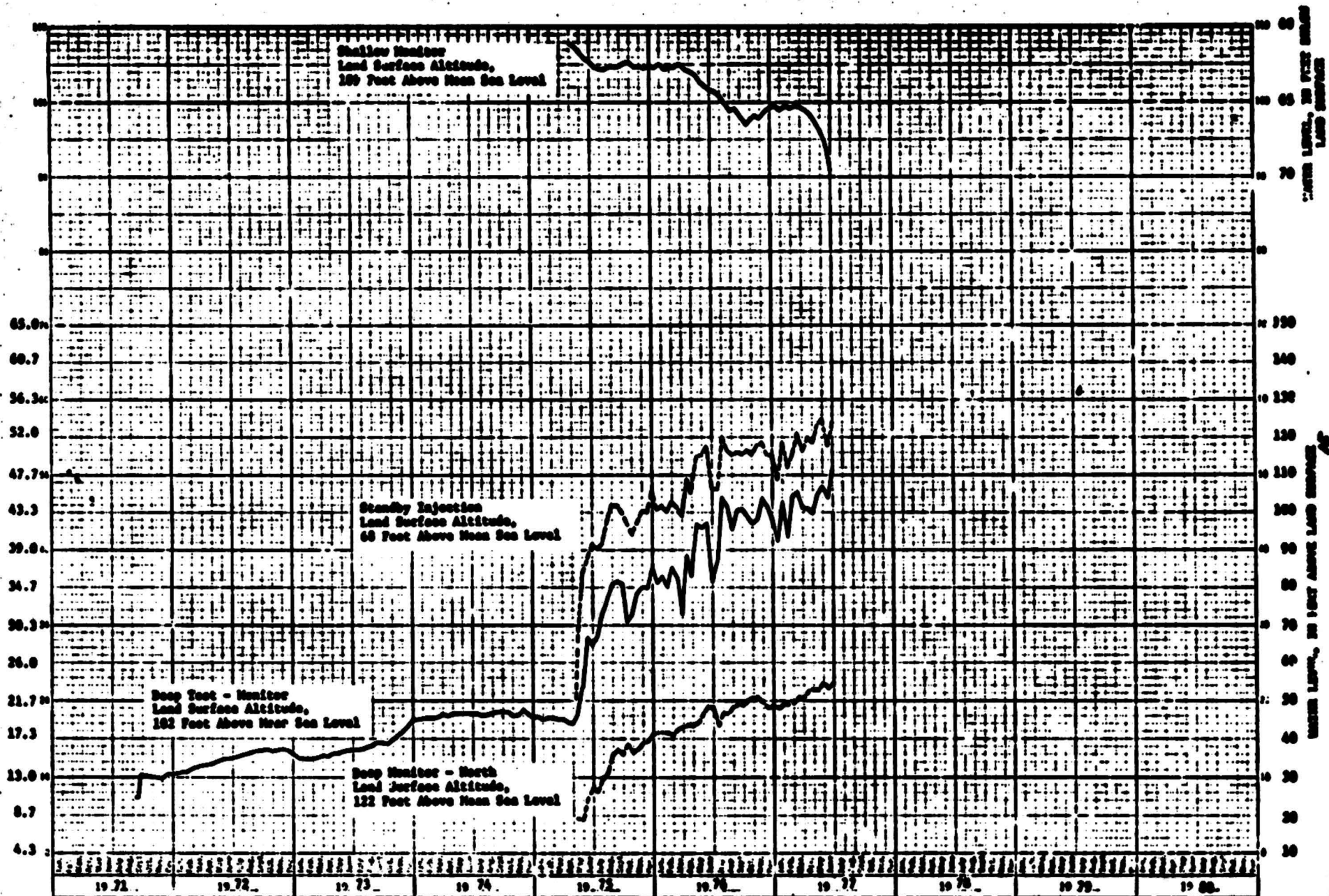


Figure 5.—Hydrographs of four monitor wells.

WATER LEVEL, IN FEET BELOW LAND SURFACE

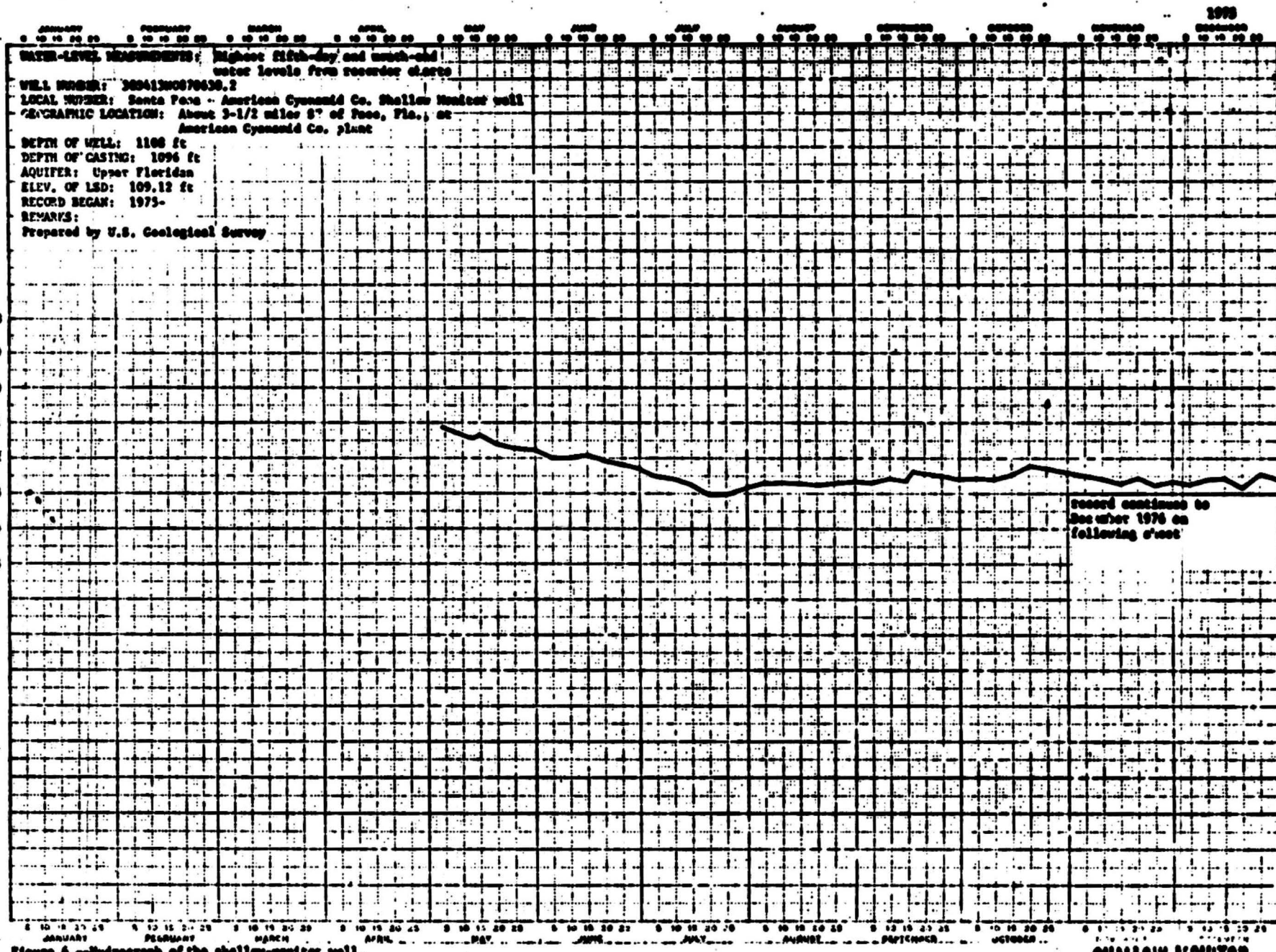


Figure 6.--Hydrograph of the shallow-monitor well.

AMERICAN CYNAMID COMPANY

1976

JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER

WATER-LEVEL MEASUREMENTS: Highest flood-tide and mean-low water levels from previous chart

WELL NUMBER: 5034130070430.2

LOCAL NUMBER: Santa Rosa - American Cyanamid Co. Shallow Monitor Well

GEOGRAPHIC LOCATION: About 3-1/2 miles SE of Pace, Fla., at American Cyanamid Co. plant

DEPTH OF WELL: 1100 ft

DEPTH OF CASING: 1096 ft

AQUIFER: Upper Floridan

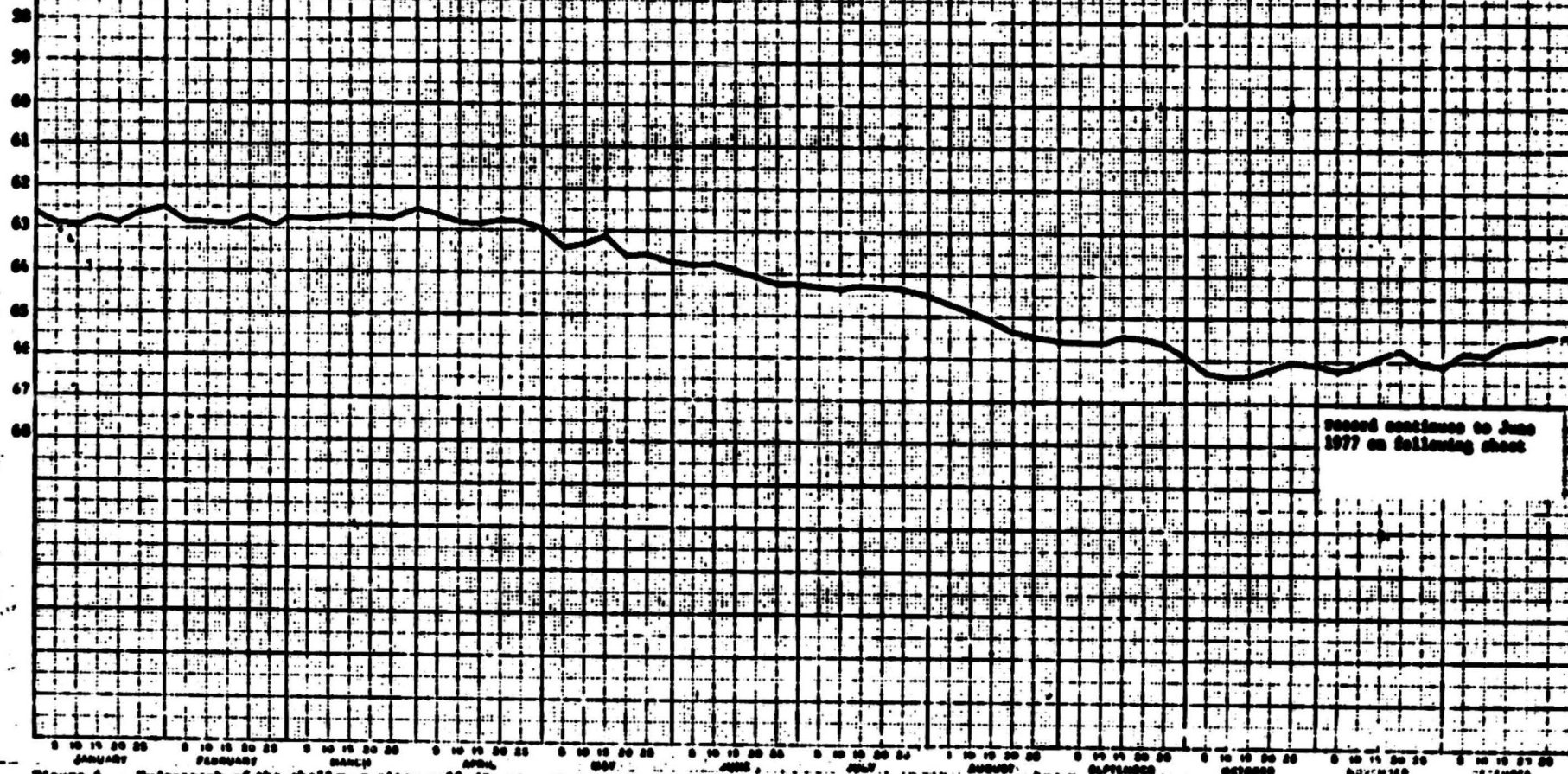
ELEV. OF LGS: 109.12 ft

RECORD BEGAN: 1975-

REMARKS:

Prepared by U.S. Geological Survey

WATER LEVEL, IN FEET BELOW LAND SURFACE



Record continues to June 1977 on following sheet

Figure 4. —Hydrograph of the shallow-monitor well—(Continued)

7:24000

WATER LEVEL, IN FEET BELOW LAND SURFACE

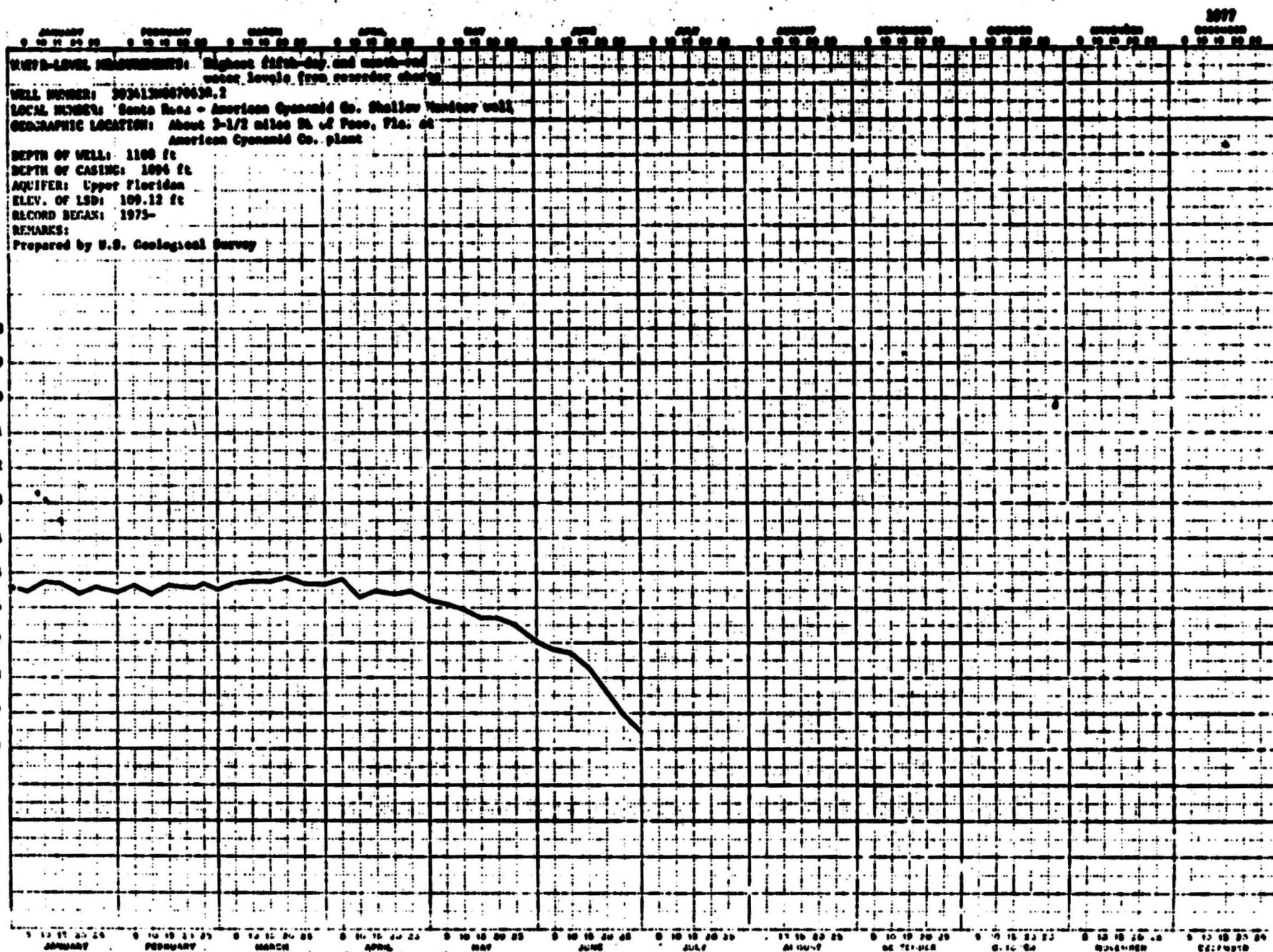
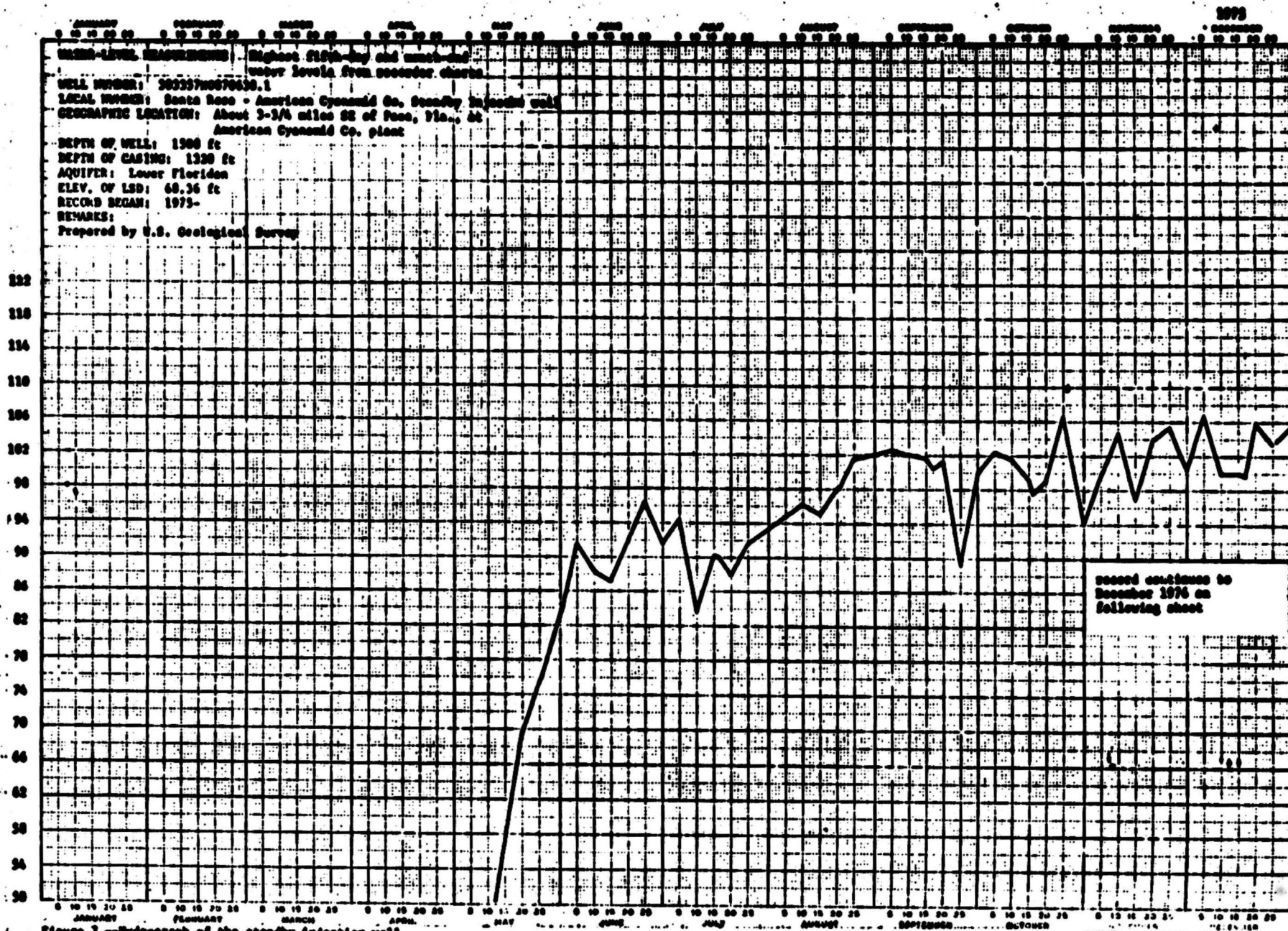


Figure 6. —Hydrograph of the shallow monitor well—(Continued)

WATER LEVEL, IN FEET ABOVE LAND SURFACE



STANDBY INJECTION

WATER LEVEL, IN FEET ABOVE LAND SURFACE

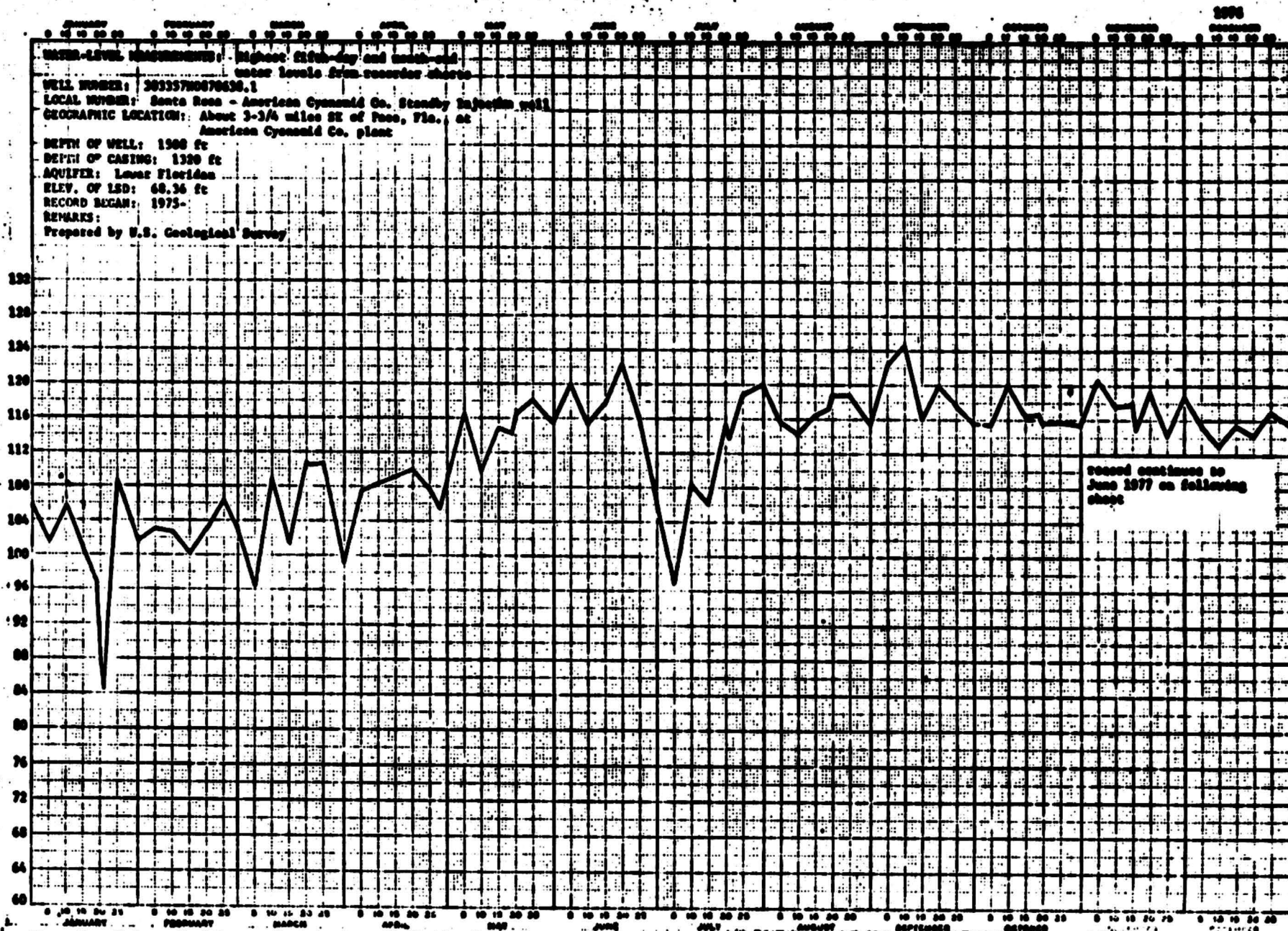


Figure 7. —Hydrograph of the standby injection well—(Continued)

STANDBY INJECTION

NO. 1 YEAR OF DATA OF 2000
 DATE OF 2000 DIVISION
 DATE OF 2000 DIVISION

WATER LEVEL, IN FEET ABOVE LAND SURFACE

140
136
132
128
124
120
116
112
108
104
100
96
92
88
84

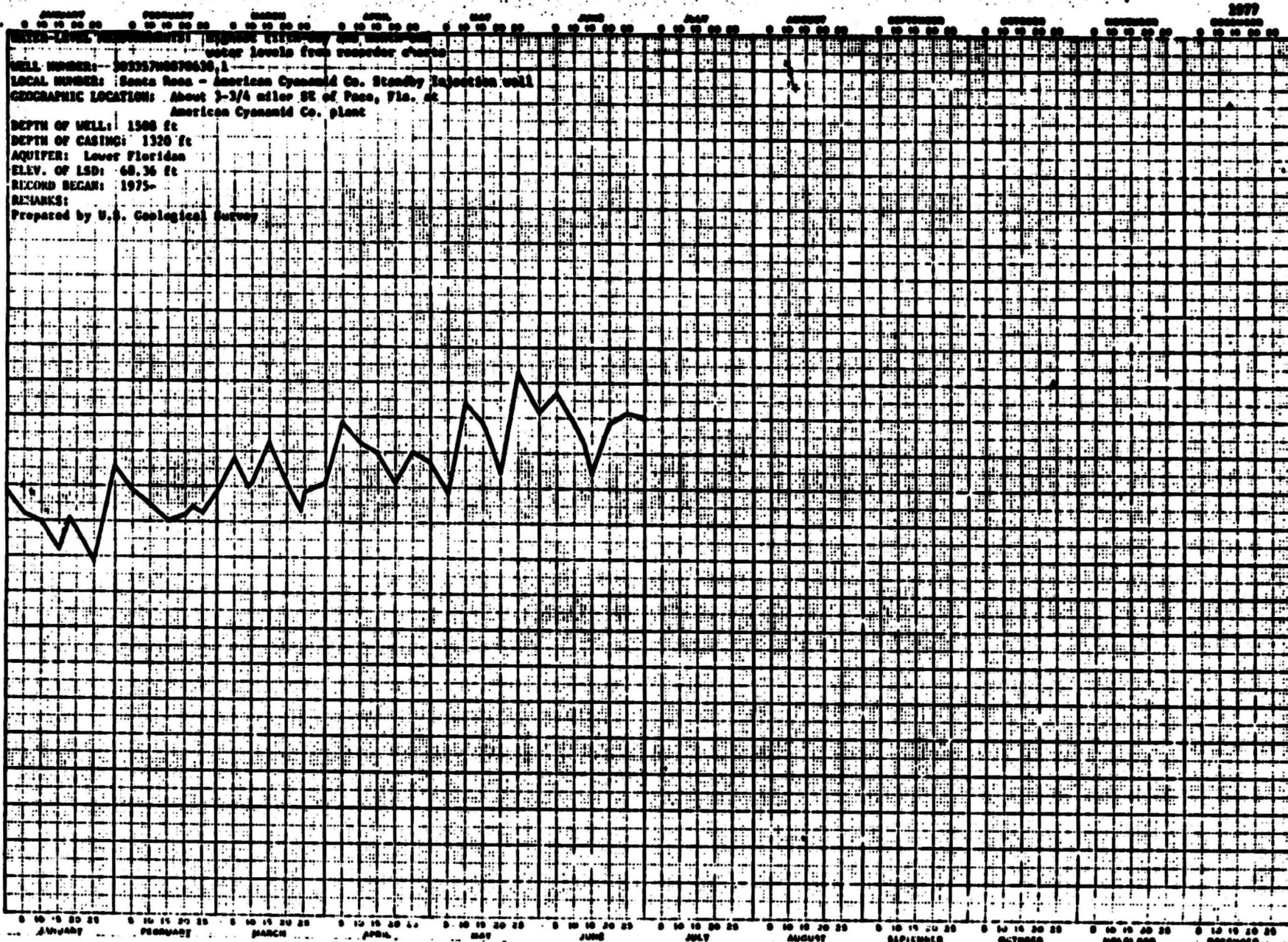


Figure 7. --Hydrograph of the standby injection well--(Continued)

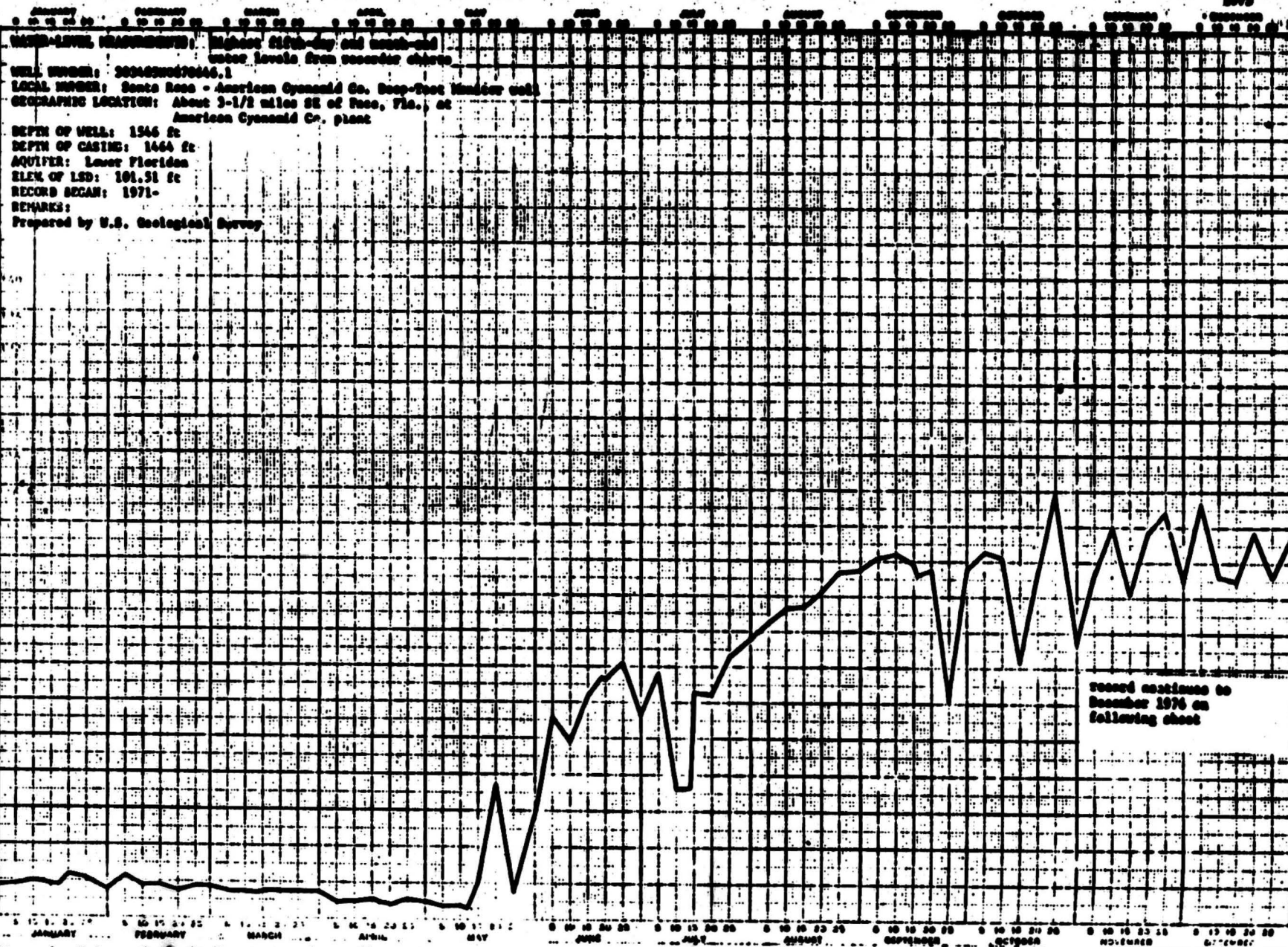


Figure 8.—Hydrograph of the deep-test monitor well.

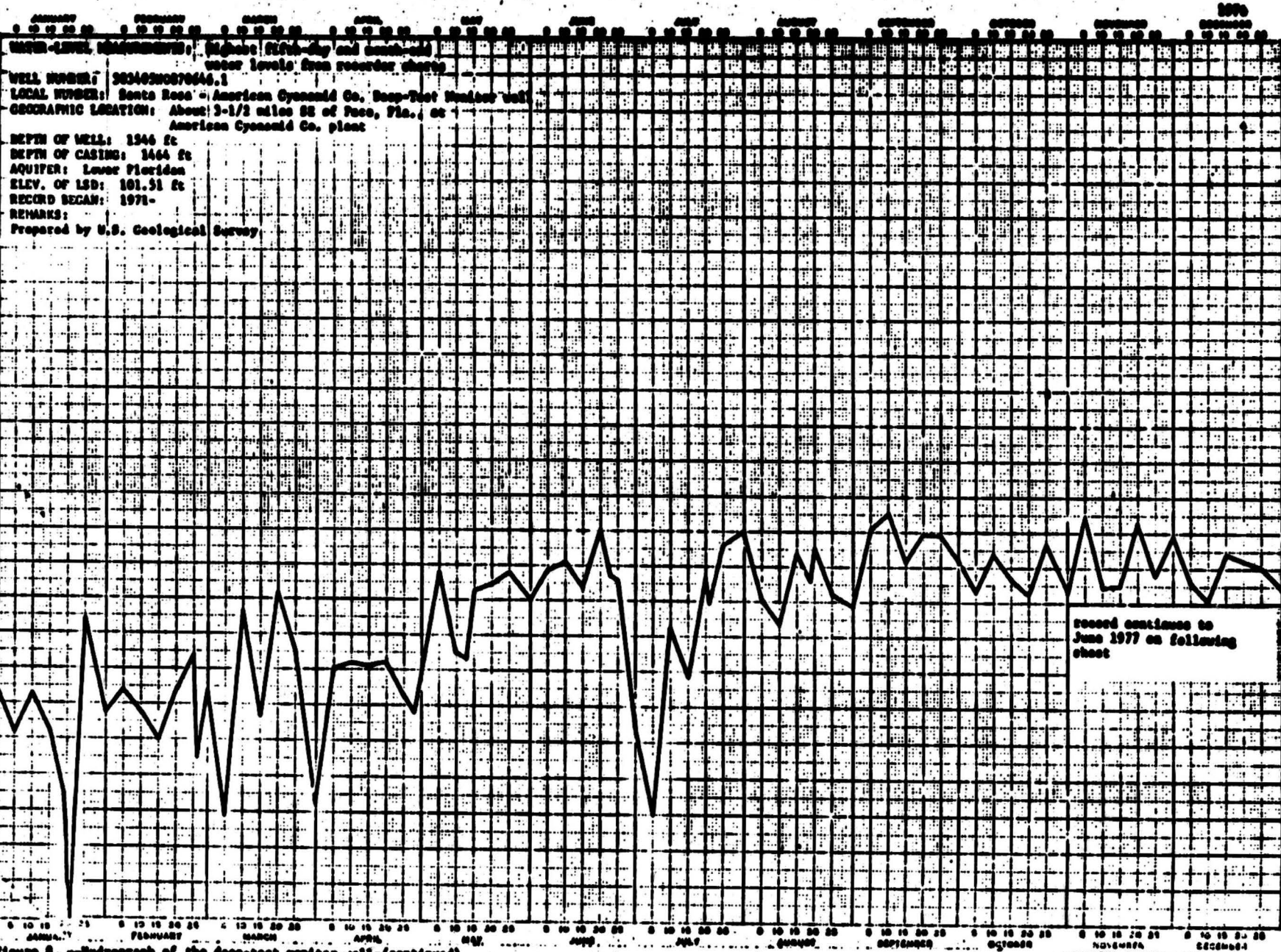


Figure 8. --Hydrograph of the deep-test monitor well--(continues)

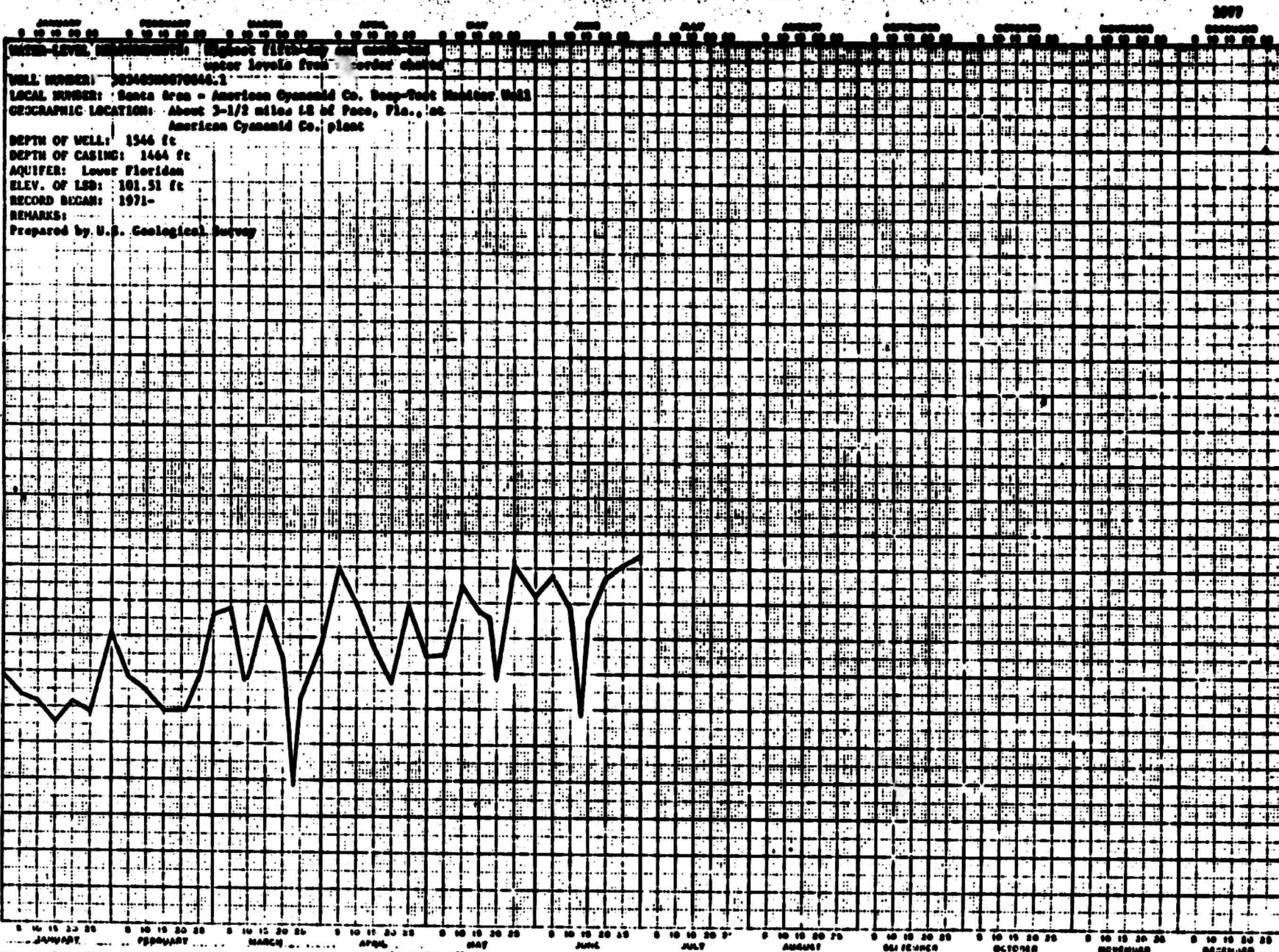


Figure 2. --Hydrograph of the deep-test monitor well--(Continued)

WATER LEVEL, IN FEET ABOVE LAND SURFACE

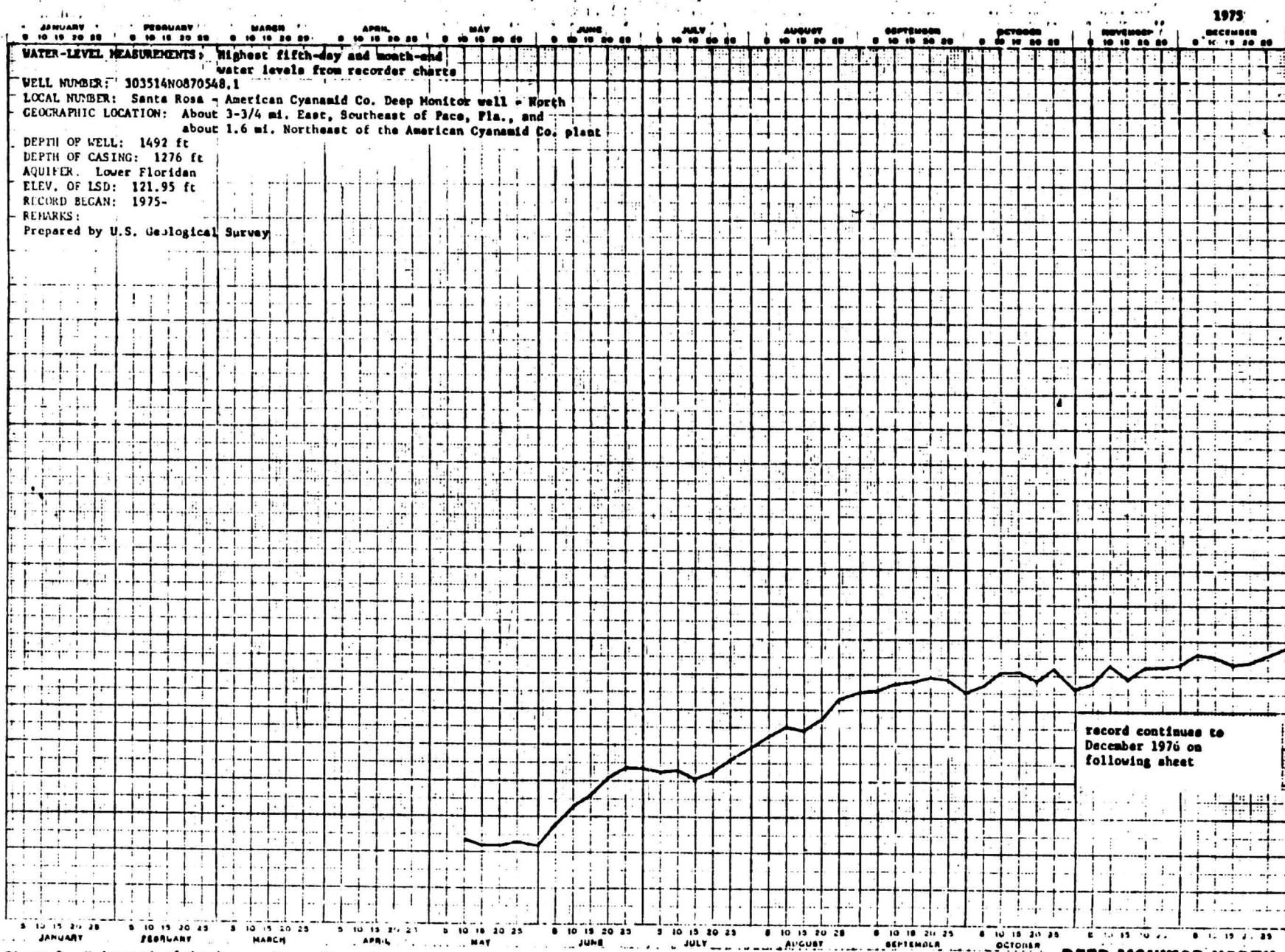


Figure 9.—Hydrograph of the deep-monitor well-north.

DEEP MONITOR NORTH

1976

WATER LEVEL, IN FEET ABOVE LAND SURFACE

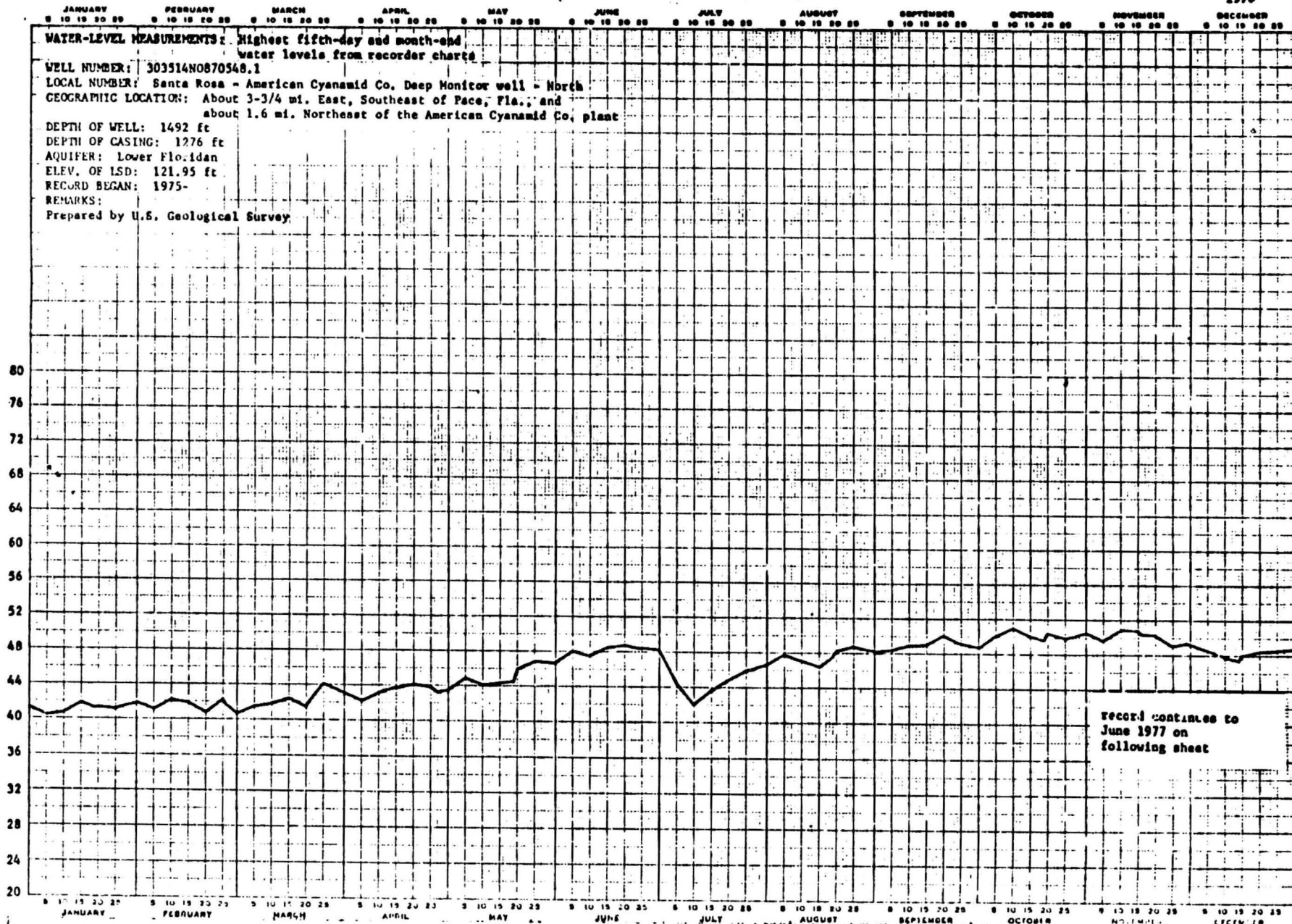


Figure 9. --Hydrograph of the deep-monitor well-north--(Continued)

DEEP MONITOR NORTH

WATER LEVEL, IN FEET ABOVE LAND SURFACE

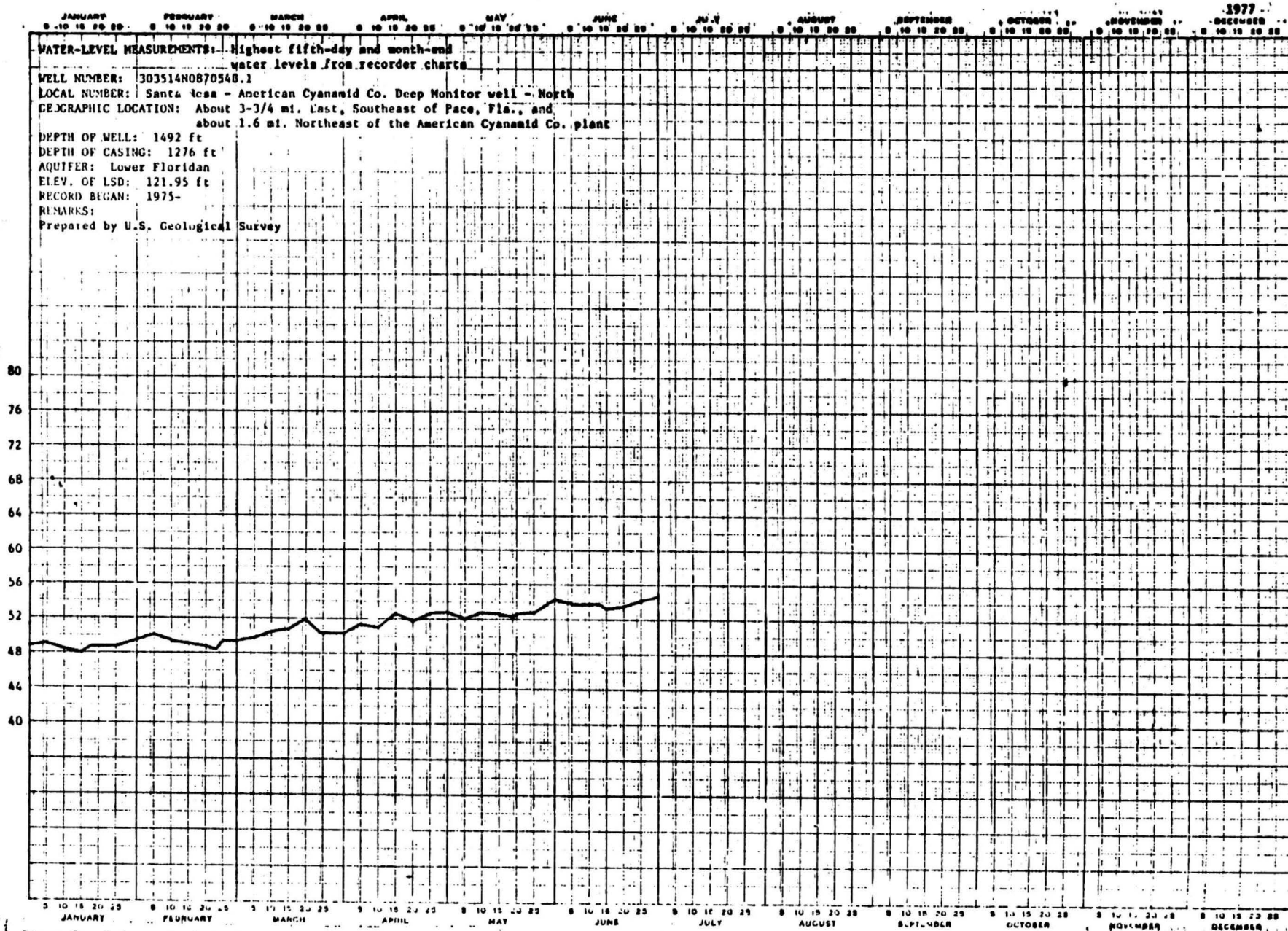


Figure 9. --Hydrograph of the deep-monitor well--North--(Continued)

Chemical Analyses of Water Samples

No significant changes were detected in the chemical character of water from the deep-monitor well-north and shallow-monitor well in samples collected through June 14, 1977 (tables 1-4). In water from the deep-test monitor well, however, bicarbonate concentration increased to 1,500 mg/L in June 1977 (table 3), about 1,100 mg/L over background (the approximate composition of the native ground water before injection began). Since February 1976, bicarbonate has ranged from 572 mg/L in March 1976 to 1,580 mg/L in May 1977. Dissolved organic carbon also increased over background to 5.0 mg/L in February 1976 and since has increased to as high as 68 mg/L in January and May 1977 and to 44 mg/L in June 1977. Total organic nitrogen and total nitrogen also increased over background at the deep-test monitor well; total organic nitrogen from 1.8 mg/L in February 1976 to 27 mg/L in May 1977 and total nitrogen from 6.2 mg/L to 49 mg/L. Sulfate concentration also increased, ranging from 4.0 mg/L in January 1976 to 750 mg/L in February 1977. In contrast to the increased concentrations of bicarbonate, dissolved organic carbon, nitrogen, and sulfate, there have been marked decreases in concentrations of calcium, chloride, magnesium, and sodium from August 1975 to June 1977.

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Table 1.--Chemical analyses of water from the shallow monitor well, December 1974 - June 1977.

DATE	TIME	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS) (00095)	PH (UNITS) (00400)	TEMPER- ATURE (DEG C) (00010)	BICAR- BONATE (HCO3) (MG/L) (00440)	CAR- BONATE (CO3) (MG/L) (00445)	TOTAL ACIDITY AS H+ (MG/L) (71825)	ALKA- LINITY AS CaCO3 (MG/L) (00410)	DIS- SOLVED CAL- CIUM (CA) (MG/L) (00915)	DIS- SOL- VED ORGANIC CARBON (C) (MG/L) (00681)
DEC . 1974										
20...	1300	1030	8.7	31.0	560	8	--	473	4.5	--
20...	1330	950	8.8	31.0	668	4	--	555	7.3	--
JUL . 1975										
16...	0850	2400	8.8	24.0	613	44	.0	576	2.2	3.0
AUG										
21...	1005	1340	8.9	24.0	618	41	--	575	1.5	3.0
SEP										
17...	1120	1290	8.9	24.0	620	41	--	577	1.4	5.0
OCT										
15...	1545	1340	8.9	24.0	618	40	--	573	1.6	3.0
NOV										
18...	1610	1330	8.9	24.0	611	47	--	579	1.7	11
DEC										
15...	1335	1400	8.8	24.0	619	30	--	558	1.9	5.0
JAN . 1976										
20...	1115	1190	8.7	24.0	638	34	.0	580	1.6	4.0
FEB										
26...	1030	1260	8.8	23.5	615	48	--	584	1.6	6.0
MAR										
20...	1410	1300	8.9	24.0	632	41	--	587	1.7	6.0
APR										
27...	1515	1320	9.0	24.0	576	47	--	551	1.6	4.0
MAY										
18...	1605	1280	9.0	24.0	630	44	--	590	2.1	7.0
JUN										
24...	0900	1330	8.9	24.0	632	42	--	588	2.0	4.0
JUL										
21...	0920	1360	8.9	24.0	633	42	.0	589	1.6	3.0
AUG										
18...	1425	1320	8.9	24.0	635	42	--	591	1.9	4.0
SEP										
15...	1425	1320	8.8	24.0	641	38	--	589	1.5	5.0
OCT										
19...	1510	1320	8.8	24.0	637	38	--	586	1.4	4.0
NOV										
15...	1510	1300	8.8	24.5	639	38	--	587	2.3	--
DEC										
15...	1245	1300	8.8	24.5	632	39	--	583	1.4	2.0
JAN . 1977										
19...	1400	1320	8.7	24.5	647	29	.0	579	1.6	6.0

Table 1.--Chemical analyses of water from the shallow-monitor well, December 1974 - June 1977--Continued

DATE	CHEM- ICAL OXYGEN DEMAND (HIGH LEVEL) (MG/L) (00340)	DIS- SOLVED CHLO- RIDE (CL) (MG/L) (00940)	COLOR (PLAT- INUM- COBALT UNITS) (00080)	CYANIDE (CN) (MG/L) (00720)	DIS- SOLVED SOLIDS (RESI- DUE AT 180 C) (MG/L) (70300)	DIS- SOLVED FLUO- RIDE (F) (MG/L) (00950)	HARD- NESS (CA+MG) (MG/L) (00900)	NON- CAR- BONATE HARD- NESS (MG/L) (00902)	DIS- SOLVED MAG- NE- SIUM (MG) (MG/L) (00925)	DIS- SOLVED SULFATE (SO4) (MG/L) (00945)
DEC . 1974										
20...	--	80	90	--	614	4.9	15	0	.9	4.2
20...	--	87	90	--	509	5.0	22	0	.8	4.1
JUL . 1975										
16...	26	86	100	.00	840	3.8	8	0	.7	.2
AUG										
21...	--	84	--	--	--	4.6	7	0	.7	--
SLP										
17...	--	85	--	--	--	5.0	7	0	.7	--
OCT										
15...	--	85	--	--	--	4.9	6	0	.6	--
NOV										
1...	--	84	--	--	--	4.9	7	0	.7	--
DEC										
15...	--	85	--	--	--	4.7	8	0	.7	--
JAN . 1976										
20...	110	88	110	.00	803	4.8	6	0	.5	.4
FEB										
26...	--	90	--	--	--	5.1	7	0	.7	--
MAR										
20...	--	85	--	--	--	4.8	7	0	.6	--
APR										
27...	--	90	--	--	--	4.5	7	0	.7	--
MAY										
18...	--	86	--	--	--	4.7	9	0	.8	--
JUN										
24...	--	95	--	--	--	4.8	8	0	.7	4.0
JUL										
21...	32	90	80	.00	817	4.7	7	0	.6	3.0
AUG										
18...	--	90	--	--	--	4.8	8	0	.7	4.2
SEPT										
15...	--	90	--	--	--	4.9	7	0	.7	.8
OCT										
18...	22	85	--	--	--	4.6	6	0	.7	1.0
NOV										
13...	29	85	--	--	--	4.7	9	0	.8	.7
DEC										
15...	33	85	--	--	--	4.5	6	0	.7	3.2
JAN . 1977										
19...	32	85	120	.00	803	4.7	8	0	.9	4.7

Table 1.—Chemical analyses of water from the shallow-monitor well, December 1974 - June 1977—Continued

DATE	TOTAL NITRATE (N) (MG/L) (00620)	TOTAL NITRITE (N) (MG/L) (00615)	TOTAL AMMONIA NITRO- GEN (N) (MG/L) (00610)	TOTAL ORGANIC NITRO- GEN (N) (MG/L) (00605)	TOTAL NITRO- GEN (N) (MG/L) (00600)	TOTAL ORTHO PHOS- PHORUS (P) (MG/L) (70507)	TOTAL PHOS- PHORUS (P) (MG/L) (00665)	DIS- SOLVED PO- TAS- SIUM (K) (MG/L) (00935)	DIS- SOLVED SILICA (SiO2) (MG/L) (00955)	DIS- SOLVED SODIUM (NA) (MG/L) (00930)
DEC , 1974										
20...	--	--	--	--	--	--	--	5.0	19	320
20...	--	.02	.90	.43	3.8	.08	.08	5.0	19	320
JUL , 1975										
16...	.00	.00	1.0	.60	1.6	.00	.08	5.6	14	330
AUG										
21...	.02	.01	1.2	.60	1.8	.07	.07	--	--	--
SEP										
17...	.00	.01	1.1	.24	1.3	.03	.03	--	--	--
OCT										
15...	.00	.01	.94	.28	1.2	.08	.08	--	--	--
NOV										
18...	.01	.02	1.2	.37	1.6	.08	.08	--	--	--
DEC										
15...	.02	.03	1.0	.32	1.3	.09	.11	--	--	--
JAN , 1976										
20...	.03	.03	1.2	.42	1.6	.08	.08	5.2	12	330
FEB										
26...	.00	.01	1.0	.23	1.2	.08	.08	--	--	--
MAR										
23...	.00	.01	1.1	.33	1.4	.09	.09	--	--	--
APR										
27...	.00	.01	1.1	.24	1.3	.08	.08	--	--	--
MAY										
18...	.00	.00	1.0	.18	1.2	.08	.08	--	--	--
JUN										
24...	.00	.01	1.0	.17	1.1	.09	.09	--	--	--
JUL										
21...	.00	.01	.94	.27	1.2	.09	.09	5.3	14	320
AUG										
18...	.00	.01	1.0	.17	1.2	.08	.09	--	--	--
SEP										
15...	.00	.01	.99	.08	1.0	.09	.09	--	--	--
OCT										
18...	.00	.01	1.0	.17	1.1	.08	.08	--	--	--
NOV										
15...	.01	.00	.98	.19	1.1	.08	.03	--	--	--
DEC										
15...	.00	.01	.98	.12	1.1	.08	.08	--	--	--
JAN , 1977										
19...	.00	.01	.94	.23	1.1	.09	.09	5.8	15	320

Table 1.--Chemical analyses of water from the shallow-monitor well, December 1974 - June 1977--Continued

DATE	DIS- SOLVED STRON- TIUM (SR) (UG/L) (01080)	TUR- BID- ITY (JTU) (00070)	DIS- SOLVED ALUM- INUM (AL) (UG/L) (01106)	DIS- SOLVED ARSENIC (AS) (UG/L) (01000)	DIS- SOLVED BORON (B) (UG/L) (01020)	DIS- SOLVED CAD- MIUM (CD) (UG/L) (01025)	DIS- SOLVED CHRO- MIUM (CR) (UG/L) (01030)	HEXA- VALENT CHRO- MIUM (CR6) (UG/L) (01032)	DIS- SOLVED COBALT (CO) (UG/L) (01035)	DIS- SOLVED COPPER (CU) (UG/L) (01040)
DEC , 1974										
20...	130	--	--	--	--	--	--	--	--	--
20...	100	--	--	--	--	--	--	--	--	--
JUL , 1975										
15...	60	6	20	0	740	0	0	0	1	0
AUG										
21...	--	2	--	--	--	--	--	--	--	--
SEP										
17...	--	3	--	--	--	--	--	--	--	--
OCT										
15...	--	5	--	--	--	--	--	--	--	--
NOV										
18...	--	0	--	--	--	--	--	--	--	--
DEC										
15...	--	6	--	--	--	--	--	--	--	--
JAN , 1976										
20...	180	6	10	0	2600	0	0	0	0	0
FEB										
26...	--	7	--	--	--	--	--	--	--	--
MAR										
20...	--	3	--	--	--	--	--	--	--	--
APR										
27...	--	3	--	--	--	--	--	--	--	--
MAY										
18...	--	4	--	--	--	--	--	--	--	--
JUN										
24...	--	2	--	--	--	--	--	--	--	--
JUL										
21...	160	2	--	1	1900	--	--	--	--	0
AUG										
18...	--	3	--	--	--	--	--	--	--	--
SEP										
15...	--	3	--	--	--	--	--	--	--	--
OCT										
18...	--	2	--	--	--	--	--	--	--	--
NOV										
15...	--	2	--	--	--	--	--	--	--	--
DEC										
15...	--	2	--	--	--	--	--	--	--	--
JAN , 1977										
19...	200	2	--	0	3100	--	--	--	--	0

Table 1.—Chemical analyses of water from the shallow-monitor well, December 1974 - June 1977-Continued

DATE	DIS- SOLVED IRON (FE) (UG/L) (01046)	DIS- SOLVED LEAD (PB) (UG/L) (01049)	DIS- SOLVED LITHIUM (LI) (UG/L) (01130)	DIS- SOLVED MAN- GANESE (MN) (UG/L) (01056)	DIS- SOLVED MERCURY (HG) (UG/L) (71890)	DIS- SOLVED MOLYB- DENUM (MO) (UG/L) (01060)	DIS- SOLVED NICKEL (NI) (UG/L) (01065)	DIS- SOLVED VAN- ADIUM (V) (UG/L) (01085)	DIS- SOLVED ZINC (ZN) (UG/L) (01090)
DEC , 1974									
20...	160	--	--	--	--	--	--	--	--
20...	160	--	--	--	--	--	--	--	--
JUL , 1975									
16...	170	8	--	0	.1	--	--	--	3
AUG									
21...	--	--	--	--	--	--	--	--	--
SEP									
17...	--	--	--	--	--	--	--	--	--
OCT									
15...	--	--	--	--	--	--	--	--	--
NOV									
18...	--	--	--	--	--	--	--	--	--
DEC									
15...	--	--	--	--	--	--	--	--	--
JAN , 1976									
20...	160	8	--	10	.0	--	--	--	10
FEB									
26...	--	--	--	--	--	--	--	--	--
MAR									
20...	--	--	--	--	--	--	--	--	--
APR									
27...	--	--	--	--	--	--	--	--	--
MAY									
18...	--	--	--	--	--	--	--	--	--
JUN									
24...	--	--	--	--	--	--	--	--	--
JUL									
21...	130	--	--	--	--	--	--	--	10
AUG									
18...	--	--	--	--	--	--	--	--	--
SEP									
15...	--	--	--	--	--	--	--	--	--
OCT									
18...	--	--	--	--	--	--	--	--	--
NOV									
15...	--	--	--	--	--	--	--	--	--
DEC									
15...	--	--	--	--	--	--	--	--	--
JAN , 1977									
19...	110	--	--	--	--	--	--	--	0

Table 1.--Chemical analyses of water from the shallow-monitor well, December 1974 - June 1977--Continued

DATE	TIME	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS) (00095)	PH (UNITS) (00400)	TEMPER- ATURE (DEG C) (00010)	BICAR- BONATE (HCO3) (MG/L) (00440)	CAR- BONATE (CO3) (MG/L) (00445)	TOTAL ACIDITY AS H+ (MG/L) (71825)	ALKA- LINITY AS CACO3 (MG/L) (00410)	DIS- SOLVED CAL- CIUM (CA) (MG/L) (00915)	DIS- SOL- VED ORGANIC CARBON (C) (MG/L) (00681)
FEB . 1977										
22...	1015	1300	9.0	24.5	629	43	--	588	1.7	11
MAR										
23...	1510	1310	9.0	24.5	626	45	--	588	1.7	4.0
APR										
21...	1025	1360	9.0	24.5	618	47	--	585	1.5	4.0
MAY										
19...	1025	1360	9.0	24.5	636	35	--	580	1.5	--
JUN										
14...	1435	1360	8.7	24.0	657	18	--	569	2.3	--

Table 1.--Chemical analyses of water from the shallow-monitor well, December 1974 - June 1977--Continued

DATE	CHEM- ICAL OXYGEN DEMAND (HIGH LEVEL) (MG/L) (00340)	DIS- SOLVED CHLO- RIDE (CL) (MG/L) (00940)	COLOR (PLAT- INUM- CORAL COBALT UNITS) (00080)	CYANIDE (CN) (MG/L) (00720)	DIS- SOLVED SOLIDS (RESI- DUE AT 180 C) (MG/L) (70300)	DIS- SOLVED FLUO- RIDE (F) (MG/L) (00950)	HARD- NESS (CA+MG) (MG/L) (00900)	NON- CAR- BONATE HARD- NESS (MG/L) (00902)	DIS- SOLVED MAG- NE- SIUM (MG) (MG/L) (00925)	DIS- SOLVED SULFATE (SO4) (MG/L) (00945)
FEB . 1977										
22...	--	88	--	--	--	4.8	8	0	.8	--
MAR										
23...	--	--	--	--	--	4.8	7	0	.7	3.2
APR										
21...	33	92	--	--	--	4.5	7	0	.9	.6
MAY										
19...	24	92	--	--	--	5.2	7	0	.7	7.0
JUN										
14...	16	90	--	--	--	5.0	9	0	.8	--

Table 1.--Chemical analyses of water from the shallow-monitor well, December 1974 - June 1977-Continued

	TOTAL NITRATE (N) (MG/L) (0062)	TOTAL NITRITE (N) (MG/L) (00615)	TOTAL AMMONIA NITRO- GEN (N) (MG/L) (00610)	TOTAL ORGANIC NITRO- GEN (N) (MG/L) (00605)	TOTAL NITRO- GEN (N) (MG/L) (00600)	TOTAL ORTHO PHOS- PHORUS (P) (MG/L) (70507)	TOTAL PHOS- PHORUS (P) (MG/L) (00665)	DIS- SOLVED PO- TAS- SIUM (K) (MG/L) (00935)	DIS- SOLVED SILICA (SiO2) (MG/L) (00955)	DIS- SOLVED SODIUM (NA) (MG/L) (00930)
DATE										
FEB . 1977										
22...	.00	.01	1.0	.27	1.2	.08	.08	--	--	--
MAR										
23...	.00	.01	.88	.19	1.0	.08	.08	--	--	--
APR										
21...	.00	.00	.97	.19	1.1	.08	.08	--	--	--
MAY										
19...	.01	.00	.85	.29	1.1	.08	.08	--	--	--
JUN										
14...	.00	.01	1.0	.00	1.0	.08	.08	--	--	--

Table 1.--Chemical analyses of water from the shallow-monitor well, December 1974 - June 1977-Continued

DATE	DIS- SOLVED STRON- TIUM (SR) (UG/L) (01080)	TUR- BID- ITY (JTU) (00070)	DIS- SOLVED ALUM- INUM (AL) (UG/L) (01106)	DIS- SOLVED ARSENIC (AS) (UG/L) (01000)	DIS- SOLVED BORON (B) (UG/L) (01020)	DIS- SOLVED CAD- MIUM (CD) (UG/L) (01025)	DIS- SOLVED CHRO- MIUM (CR) (UG/L) (01030)	HEXA- VALENT CHRO- MIUM (CR6) (UG/L) (01032)	DIS- SOLVED COBALT (CO) (UG/L) (01035)	DIS- SOLVED COPPER (CU) (UG/L) (01040)
FEB , 1977										
22...	--	2	--	--	--	--	--	--	--	--
MAR										
23...	--	2	--	--	--	--	--	--	--	--
APR										
21...	--	1	--	--	--	--	--	--	--	--
MAY										
19...	--	2	--	--	--	--	--	--	--	--
JUN										
14...	--	1	--	--	--	--	--	--	--	--

Table 1.--Chemical analyses of water from the shallow-monitor well, December 1974 - June 1977--Continued

DATE	DIS- SOLVED IRON (FE) (UG/L) (01046)	DIS- SOLVED LEAD (PB) (UG/L) (01049)	DIS- SOLVED LITHIUM (LI) (UG/L) (01130)	DIS- SOLVED MAN- GANESE (MN) (UG/L) (01056)	DIS- SOLVED MERCURY (HG) (UG/L) (71890)	DIS- SOLVED MOLYB- DENUM (MO) (UG/L) (01060)	DIS- SOLVED NICKEL (NI) (UG/L) (01065)	DIS- SOLVED VANNA- DIUM (V) (UG/L) (01085)	DIS- SOLVED ZINC (ZN) (UG/L) (01090)
FEB . 1977									
22...	--	--	--	--	--	--	--	--	--
MAR									
23...	--	--	--	--	--	--	--	--	--
APR									
21...	--	--	--	--	--	--	--	--	--
MAY									
19...	--	--	--	--	--	--	--	--	--
JUN									
14...	--	--	--	--	--	--	--	--	--

Table 2.--Chemical analyses of water from the standby injection well, May 1975 - June 1977.

DATE	TIME	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS) (00095)	PH (UNITS) (00400)	TEMPER- ATURE (DEG C) (00010)	BICAR- BONATE (HCO3) (MG/L) (00440)	CAR- BONATE (CO3) (MG/L) (00445)	TOTAL ACIDITY AS H+ (MG/L) (71825)	ALKA- LINITY AS CACO3 (MG/L) (00410)	DIS- SOLVED CAL- CIUM (CA) (MG/L) (00915)	DIS- SOL- VED ORGANIC CARBON (C) (MG/L) (00681)
MAY , 1975										
20...	1030	12300	7.5	27.0	365	0	--	299	110	--
20...	1100	25100	7.3	28.0	163	0	--	134	470	3.0
20...	1'30	26450	7.7	--	130	0	--	107	--	--
20...	1230	19900	7.6	30.0	252	0	--	207	290	4.0
JUL										
10...	1000	15000	7.2	32.5	208	0	.4	171	200	2.0
AUG										
22...	0935	20000	7.6	33.5	273	0	--	224	170	1.0
SEP										
11...	1550	22500	7.6	32.5	259	0	--	212	230	.0
OCT										
16...	1410	22000	7.6	32.5	249	0	--	204	220	.0
NOV										
19...	1505	21600	7.5	32.5	255	0	--	209	220	6.0
DEC										
17...	1340	22600	7.6	32.5	254	0	--	208	220	1.0
JAN , 1976										
21...	1410	23500	7.5	34.0	269	0	.5	221	200	1.0
MAR										
21...	1125	15800	7.7	32.5	348	0	--	285	190	1.0
APR										
28...	0925	16900	7.7	32.5	337	0	--	276	140	.0
MAY										
19...	1415	14500	7.8	32.5	350	0	--	287	110	.0
JUN										
25...	0955	17500	7.7	32.5	344	0	--	282	130	1.0
JUL										
21...	1610	17300	7.8	32.5	357	0	.2	293	120	.0
AUG										
19...	1705	15400	7.6	32.0	360	0	--	295	110	3.0
SEP										
16...	1130	15500	7.6	32.0	367	0	--	301	120	6.0
OCT										
19...	1410	17000	7.8	32.5	382	0	--	313	120	4.0
NOV										
16...	1415	14000	7.7	32.5	396	0	--	325	130	--
DEC										
15...	0940	15000	7.6	32.0	409	0	--	335	130	6.0
JAN , 1977										
18...	0915	11800	7.7	30.0	450	0	.1	369	130	11

Table 2.--Chemical analyses of water from the standby injection well, May 1975 - June 1977--Continued

DATE	CHEM- ICAL OXYGEN DEMAND (HIGH LEVEL) (MG/L) (00340)	DIS- SOLVED CHLO- RIDE (CL) (MG/L) (00940)	COLOR (PLAT- INUM- COBALT UNITS) (00080)	CYANIDE (CN) (MG/L) (00720)	DIS- SOLVED SOLIDS (RESI- DUE AT 180 C) (MG/L) (70300)	DIS- SOLVED FLUO- RIDE (F) (MG/L) (00950)	HARD- NESS (CA, MG) (MG/L) (00900)	NON- CAR- BONATE HARD- NESS (MG/L) (00902)	DIS- SOLVED MAG- NE- SIUM (MG) (MG/L) (00925)	DIS- SOLVED SULFATE (SO4) (MG/L) (00945)
MAY 1975										
20...	--	3800	0	--	7060	4.4	520	220	56	.0
20...	--	8800	5	--	16100	3.9	1900	1700	160	--
20...	--	9200	10	--	16200	4.0	--	--	--	--
20...	94	6700	0	--	12000	4.1	1200	990	110	--
JUL										
16...	--	6800	5	.00	12700	2.7	1100	930	140	--
AUG										
22...	--	6600	--	--	--	3.3	960	740	130	11
SEP										
17...	--	7700	--	--	--	3.5	1400	1100	190	--
OCT										
16...	--	8000	--	--	--	3.3	1200	1000	170	--
NOV										
19...	--	8300	--	--	--	3.4	1300	1100	180	--
DEC										
17...	--	8200	--	--	--	3.2	1200	1000	170	--
JAN 1976										
21...	--	7600	5	.01	13300	3.4	1200	1000	170	--
MAR										
21...	--	5100	--	--	--	3.8	1200	930	180	--
APR										
28...	--	5600	--	--	--	3.8	800	530	110	--
MAY										
19...	--	5000	--	--	--	3.7	690	400	100	9.0
JUN										
25...	--	5400	--	--	--	3.6	740	450	100	5.0
JUL										
21...	730	5100	0	.00	9020	3.8	730	440	100	8.0
AUG										
19...	--	5100	--	--	--	3.6	670	370	95	29
SEP										
16...	--	5000	--	--	--	4.0	710	410	100	31
OCT										
19...	180	5100	--	--	--	3.8	700	390	98	22
NOV										
16...	110	5300	--	--	--	3.9	780	450	110	28
DEC										
15...	120	5400	--	--	--	3.3	780	440	110	25
JAN 1977										
18...	110	5100	10	2.0	9050	4.2	750	380	100	85

Table 2.--Chemical analyses of water from the standby injection well, May 1975 - June 1977--Continued

DATE	TOTAL NITRATE (N) (MG/L) (00620)	TOTAL NITRITE (N) (MG/L) (00615)	TOTAL AMMONIA NITRO- GEN (N) (MG/L) (00610)	TOTAL ORGANIC NITRO- GEN (N) (MG/L) (00605)	TOTAL NITRO- GEN (N) (MG/L) (00600)	TOTAL ORTHO PHOS- PHORUS (P) (MG/L) (70507)	TOTAL PHOS- PHORUS (P) (MG/L) (00665)	DIS- SOLVED PO- TAS- SIUM (K) (MG/L) (00935)	DIS- SOLVED SILICA (SiO2) (MG/L) (00955)	DIS- SOLVED SODIUM (NA) (MG/L) (00930)
MAY : 1975										
20...	.00	.01	4.6	.60	5.2	.00	.01	50	15	2400
20...	.00	.01	7.6	1.3	8.9	.00	.01	96	24	4940
20...	--	--	--	--	--	--	--	--	16	--
20...	.00	.01	6.7	1.1	7.8	.00	--	73	21	3730
JUL										
16...	.00	.00	6.9	.60	7.5	.00	.00	72	14	3900
AUG										
22...	.00	.00	6.8	1.1	7.9	.02	.02	--	14	--
SEP										
17...	.00	.00	8.2	.30	8.5	.00	.01	--	--	--
OCT										
16...	.00	.00	9.1	.65	9.7	.00	.01	--	--	--
NOV										
19...	.02	.01	8.7	.40	9.1	.01	.03	--	--	--
DEC										
17...	.03	.02	8.6	.40	9.0	.01	.03	--	--	--
JAN : 1976										
21...	.03	.02	8.5	.35	8.9	.01	.01	100	15	4500
MAR										
21...	.00	.00	6.2	.20	6.4	.01	.01	--	--	--
APR										
28...	.00	.00	6.8	.55	7.3	.00	.01	--	--	--
MAY										
19...	.00	.00	6.2	.20	6.4	.01	.01	--	--	--
JUN										
21...	.00	.00	6.2	.10	6.3	.00	.02	--	--	--
JUL										
21...	.00	.00	6.0	.20	6.2	.01	.01	60	17	3200
AUG										
19...	.00	.00	6.2	.27	6.4	.02	.03	--	--	--
SEP										
16...	.00	.01	6.4	1.1	7.5	.01	.02	--	--	--
OCT										
19...	.00	.01	6.2	1.4	7.6	.00	.02	--	--	--
NOV										
16...	.00	--	6.3	1.1	--	.01	.01	--	--	--
DEC										
15...	.00	.00	6.4	1.9	8.3	.01	.01	--	--	--
JAN : 1977										
18...	.00	.00	6.0	3.2	9.2	.01	.04	63	18	3200

Table 2.--Chemical analyses of water from the standby injection well, May 1975 - June 1977--Continued

DATE	DIS- SOLVED STRON- TIUM (SR) (UG/L) (01080)	TUR- BID- ITY (JTU) (00070)	DIS- SOLVED ALUM- INUM (AL) (UG/L) (01106)	DIS- SOLVED ARSENIC (AS) (UG/L) (01000)	DIS- SOLVED BORON (B) (UG/L) (01020)	DIS- SOLVED CAD- MIUM (CD) (UG/L) (01025)	DIS- SOLVED CHRO- MIUM (CR) (UG/L) (01030)	HEXA- VALENT CHRO- MIUM (CR6) (UG/L) (01032)	DIS- SOLVED COBALT (CO) (UG/L) (01035)	DIS- SOLVED COPPER (CU) (UG/L) (01040)
MAY , 1975										
20...	13000	70	--	--	--	--	--	--	--	--
20...	36000	140	--	--	--	--	--	--	--	--
20...	--	--	--	--	--	--	--	--	--	--
20...	24000	1000	0	13	3900	0	0	0	0	0
JUL										
16...	22000	1	0	7	1500	0	0	0	2	0
AUG										
22...	--	190	--	--	--	--	--	--	--	--
SEP										
17...	--	35	--	--	--	--	--	--	--	--
OCT										
15...	--	35	--	--	--	--	--	--	--	--
NOV										
19...	--	45	--	--	--	--	--	--	--	--
DEC										
17...	--	20	--	--	--	--	--	--	--	--
JAN , 1976										
21...	26000	15	0	3	3100	0	0	0	0	0
MAR										
21...	--	40	--	--	--	--	--	--	--	--
APR										
28...	--	20	--	--	--	--	--	--	--	--
MAY										
19...	--	30	--	--	--	--	--	--	--	--
JUN										
25...	--	35	--	--	--	--	--	--	--	--
JUL										
21...	15000	30	--	5	2200	--	--	--	--	0
AUG										
19...	--	30	--	--	--	--	--	--	--	--
SEP										
16...	--	15	--	--	--	--	--	--	--	--
OCT										
19...	--	20	--	--	--	--	--	--	--	--
NOV										
16...	--	35	--	--	--	--	--	--	--	--
DEC										
15...	--	20	--	--	--	--	--	--	--	--
JAN , 1977										
18...	15000	25	--	10	4200	--	--	--	--	0

Table 2.—Chemical analyses of water from the standby injection well May 1975 - June 1977—Continued

DATE	DIS- SOLVED IRON (FE) (UG/L) (01046)	DIS- SOLVED LEAD (PB) (UG/L) (01049)	DIS- SOLVED LITHIUM (LI) (UG/L) (01130)	DIS- SOLVED MANGANESE (MN) (UG/L) (01056)	DIS- SOLVED MERCURY (HG) (UG/L) (71890)	DIS- SOLVED MOLYB- DENUM (MO) (UG/L) (01060)	DIS- SOLVED NICKEL (NI) (UG/L) (01065)	DIS- SOLVED VANAD- IUM (V) (UG/L) (01085)	DIS- SOLVED ZINC (ZN) (UG/L) (01090)
MAY , 1975									
20...	20	--	--	--	--	--	--	--	--
20...	70	--	--	--	--	--	--	--	--
20...	--	--	--	--	--	--	--	--	--
20...	1400	0	380	40	.1	1	0	250	10
JUL									
16...	560	0	--	30	.1	--	--	--	20
AUG									
22...	--	--	--	--	--	--	--	--	--
SEP									
17...	--	--	--	--	--	--	--	--	--
OCT									
16...	--	--	--	--	--	--	--	--	--
NOV									
19...	--	--	--	--	--	--	--	--	--
DEC									
17...	--	--	--	--	--	--	--	--	--
JAN , 1976									
21...	770	6	--	30	.1	--	--	--	30
MAR									
21...	--	--	--	--	--	--	--	--	--
APR									
28...	--	--	--	--	--	--	--	--	--
MAY									
19...	--	--	--	--	--	--	--	--	--
JUN									
25...	--	--	--	--	--	--	--	--	--
JUL									
21...	30	--	--	--	--	--	--	--	10
AUG									
19...	--	--	--	--	--	--	--	--	--
SEP									
16...	--	--	--	--	--	--	--	--	--
OCT									
19...	--	--	--	--	--	--	--	--	--
NOV									
16...	--	--	--	--	--	--	--	--	--
DEC									
15...	--	--	--	--	--	--	--	--	--
JAN , 1977									
18...	300	--	--	--	--	--	--	--	0

Table 2.--Chemical analyses of water from the standby injection well, May 1975 - June 1977-Continued

DATE	TIME	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS) (00095)	PH (UNITS) (00400)	TEMPER- ATURE (DEG C) (00010)	BICAR- BONATE (HCO3) (MG/L) (00440)	CAR- BONATE (CO3) (MG/L) (00445)	TOTAL ACIDITY AS H+ (MG/L) (71825)	ALKA- LILITY AS CACO3 (MG/L) (00410)	DIS- SOLVED CAL- CIUM (CA) (MG/L) (00915)	DIS- SOL- VED ORGANI CARBO (C) (MG/L) (00681)
FEB . 1977										
22...	1350	15600	7.7	30.0	489	0	--	401	120	11
MAR										
09...	1045	--	--	--	--	--	--	--	--	--
24...	1105	17600	7.8	30.0	452	0	--	371	130	11
APR										
20...	1215	16500	7.8	31.0	547	0	--	449	120	11
MAY										
16...	1700	15700	7.8	32.0	660	0	--	541	100	
JUN										
13...	1345	15900	7.8	31.0	656	0	--	538	110	

Table 2.--Chemical analyses of water from the standby injection well, May 1975 - June 1977--Continued

DATE	CHEM- ICAL OXYGEN DEMAND (HIGH LEVEL) (MG/L) (00340)	DIS- SOLVED CHLO- RIDE (CL) (MG/L) (00940)	COLOR (PLAT- INUM- COBALT UNITS) (00080)	CYANIDE (CN) (MG/L) (00720)	DIS- SOLVED SOLIDS (RESI- DUE AT 180 C) (MG/L) (70300)	DIS- SOLVED FLUO- RIDE (F) (MG/L) (00950)	HARD- NESS (CA,MG) (MG/L) (00900)	NON- CAR- BONATE HARD- NESS (MG/L) (00902)	DIS- SOLVED MAG- NE- SIUM (MG) (MG/L) (00925)	DIS- SOLVED SULFATE (SO4) (MG/L) (00945)
FEB . 1977										
22...	--	5100	--	--	--	4.2	710	310	100	80
MAR										
09...	--	--	--	.07	--	--	--	--	--	--
24...	--	5900	--	--	--	3.8	820	450	120	88
APR										
20...	168	5300	5	.01	9140	4.0	790	340	110	140
MAY										
18...	113	4300	--	--	--	4.8	640	99	95	172
JUN										
13...	180	4800	--	--	--	4.5	670	130	96	160

Table 2.—Chemical analyses of water from the standby injection well, May 1975 - June 1977—Continued

DATE	TOTAL NITRATE (N) (MG/L) (00620)	TOTAL NITRITE (N) (MG/L) (00615)	TOTAL AMMONIA NITRO- GEN (N) (MG/L) (00610)	TOTAL ORGANIC NITRO- GEN (N) (MG/L) (00605)	TOTAL NITRO- GEN (N) (MG/L) (00600)	TOTAL ORTHO PHOS- PHORUS (P) (MG/L) (70507)	TOTAL PHOS- PHORUS (P) (MG/L) (00665)	DIS- SOLVED PO- TAS- SIUM (K) (MG/L) (00935)	DIS- SOLVED SILICA (SiO2) (MG/L) (00955)	DIS- SOLVED SODIUM (NA) (MG/L) (00930)
FEB , 1977										
22...	.00	.01	6.2	4.8	11	.01	.02	--	--	--
MAR										
09...	--	--	--	--	--	--	--	--	--	--
24...	.00	.01	6.8	2.7	9.5	.02	.03	--	--	--
APR										
20...	.00	.00	6.7	4.4	11	.01	.02	60	19	3200
MAY										
18...	.00	.00	5.9	6.4	12	.01	.02	--	--	--
JUN										
13...	.00	.00	6.6	6.0	12	.01	.03	--	--	--

Table 2.--Chemical analyses of water from the standby injection well, May 1975 - June 1977-Continued

DATE	DIS- SOLVED STRON- TIUM (SP) (UG/L) (01080)	TUR- BID- ITY (JTU) (00070)	DIS- SOLVED ALUM- INUM (AL) (UG/L) (01106)	DIS- SOLVED ARSENIC (AS) (UG/L) (01000)	DIS- SOLVED BORON (B) (UG/L) (01020)	DIS- SOLVED CAD- MIUM (CO) (UG/L) (01025)	DIS- SOLVED CHRO- MIUM (CR) (UG/L) (01030)	HEXA- VALENT CHRO- MIUM (CR6) (UG/L) (01032)	DIS- SOLVED COBALT (CO) (UG/L) (01035)	DIS- SOLVED COPPER (CU) (UG/L) (01040)
FEB • 1977										
22...	--	25	--	--	--	--	--	--	--	--
MAR										
09...	--	--	--	--	--	--	--	--	--	--
26...	--	20	--	--	--	--	--	--	--	--
APR										
20...	30000	10	--	--	--	--	--	--	--	--
MAY										
18...	--	2	--	--	--	--	--	--	--	--
JUN										
13...	--	30	--	--	--	--	--	--	--	--

Table 2.--Chemical analyses of water from the standby injection well, May 1975 - June 1977-Continued

DATE	DIS- SOLVED IRON (FE) (UG/L) (01046)	DIS- SOLVED LEAD (PB) (UG/L) (01049)	DIS- SOLVED LITHIUM (LI) (UG/L) (01130)	DIS- SOLVED MAN- GANESE (MN) (UG/L) (01056)	DIS- SOLVED MERCURY (HG) (UG/L) (71890)	DIS- SOLVED MOLYB- DENUM (MO) (UG/L) (01060)	DIS- SOLVED NICKEL (NI) (UG/L) (01065)	DIS- SOLVED VANA- DIUM (V) (UG/L) (01085)	DIS- SOLVED ZINC (ZN) (UG/L) (01090)
FEB , 1977									
22...	--	--	--	--	--	--	--	--	--
MAR									
09...	--	--	--	--	--	--	--	--	--
24...	--	--	--	--	--	--	--	--	--
APR									
20...	--	--	--	--	--	--	--	--	--
MAY									
18...	--	--	--	--	--	--	--	--	--
JUN									
.3...	--	--	--	--	--	--	--	--	--

Table 3.--Chemical analyses of water from the deer-test monitor well, August 1971 - June 1977.

DATE	TIME	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS) (00095)	PH (UNITS) (00400)	TEMPER- ATURE (DEG C) (00010)	BICAR- BONATE (HCO3) (MG/L) (00440)	CAR- BONATE (CO3) (MG/L) (00445)	TOTAL ACIDITY AS H+ (MG/L) (71825)	ALKA- LINITY AS CACO3 (MG/L) (00410)	DIS- SOLVED CAL- CIUM (CA) (MG/L) (00915)	DIS- SOL- VED ORGANIC CARBON (C) (MG/L) (00681)
AUG , 1971										
10...	--	281	8.1	26.0	126	0	--	103	7.7	--
10...	--	--	--	--	--	--	--	--	--	--
SEP										
09...	--	19600	7.5	33.5	315	0	--	258	168	--
09...	--	--	--	--	--	--	--	--	--	--
AUG , 1975										
21...	1125	10400	7.6	26.5	394	0	.0	323	65	3.0
SEP										
16...	1510	9600	7.7	26.0	391	0	--	321	54	.0
OCT										
16...	1110	9300	7.7	25.5	397	0	--	326	53	.0
NOV										
19...	0910	9300	7.6	25.0	399	0	--	327	48	7.0
DEC										
15...	1605	9000	7.7	25.0	404	0	--	331	47	1.0
JAN , 1976										
21...	1015	8500	7.7	23.0	412	0	--	338	44	2.0
FEB										
26...	1540	9200	7.7	24.5	465	0	--	381	44	5.0
MAR										
20...	1610	8300	7.8	25.0	572	0	--	469	37	11
APR										
28...	1550	8700	7.7	26.0	582	0	.1	477	39	11
MAY										
13...	1125	--	7.7	24.0	812	0	--	666	27	26
13...	1340	7700	7.8	24.0	802	0	--	658	28	25
13...	1440	8200	7.7	24.0	684	0	--	561	32	19
13...	1615	--	7.7	24.5	630	0	--	517	34	17
JUN										
24...	1515	8400	7.8	25.5	1080	0	--	886	34	34
JUL										
21...	1330	8200	7.7	25.5	1170	0	.3	960	28	35
AUG										
19...	1510	8000	7.7	25.5	1310	0	--	1070	25	44
SEP										
16...	0925	7100	7.5	26.0	1400	0	--	1150	24	50
OCT										
19...	1610	7150	7.6	26.0	1290	0	--	1060	23	47
NOV										
16...	1610	7000	7.6	24.0	1170	0	--	960	24	--

Table 3.--Chemical analyses of water from the deep-test monitor well, August 1971 - June 1977--Continued

DATE	CHEM- ICAL OXYGEN DEMAND (HIGH LEVEL) (MG/L) (00340)	DIS- SOLVED CHLO- RIDE (CL) (MG/L) (00940)	COLOR (PLAT- INUM- COBALT UNITS) (00080)	CYANIDE (CN) (MG/L) (00720)	DIS- SOLVED SOLIDS (RESI- DUE AT 160 C) (MG/L) (70300)	DIS- SOLVED FLUO- RIDE (F) (MG/L) (00950)	HARD- NESS (CA, MG) (MG/L) (00900)	NON- CAR- BONATE HARD- NESS (MG/L) (00902)	DIS- SOLVED MAG- NE- SIUM (MG) (MG/L) (00925)	DIS- SOLVED SULFATE (SO4) (MG/L) (00945)
AUG , 1971										
10...	--	13	0	--	152	.6	24	0	1.0	6.0
10...	--	--	--	--	--	--	--	--	--	--
SFP										
09...	--	6100	5	--	11400	4.1	1040	793	140	28
09...	--	--	--	--	--	--	--	--	--	--
AUG , 1975										
21...	--	3300	15	.00	5860	3.9	340	14	41	12
SEP										
16...	--	3100	--	--	--	4.0	290	0	37	--
OCT										
16...	--	3100	--	--	--	4.0	290	0	37	--
NOV										
19...	--	3100	--	--	--	4.2	270	0	36	--
DEC										
15...	--	3100	--	--	--	4.1	270	0	37	--
JAN , 1976										
21...	150	2900	110	.01	5300	4.4	260	0	34	4.0
FEB										
26...	--	2800	--	--	--	4.4	270	0	38	--
MAR										
20...	--	2600	--	--	--	4.6	220	0	32	--
APR										
28...	96	2800	10	.00	5360	4.7	230	0	31	110
MAY										
13...	--	2000	80	.02	4540	5.2	170	0	24	280
3...	--	--	--	--	--	--	180	0	26	--
13..	--	--	--	--	--	--	200	0	28	--
13...	--	2000	90	--	4880	4.8	210	0	29	120
JUN										
24...	--	2100	--	--	--	5.1	200	0	28	290
JUL										
21...	160	1900	50	.13	4640	5.1	180	0	26	300
AUG										
19...	--	1700	--	--	--	5.3	170	0	25	430
SEP										
16...	--	1600	--	--	--	5.5	160	0	24	420
OCT										
19...	210	1500	--	--	--	5.2	150	0	23	480
NOV										
16...	170	1600	--	--	--	5.0	160	0	24	375

Table 3.--Chemical analyses of water from the deep-test monitor well, August 1971 - June 1977-Continued

DATE	TOTAL NITRATE (N) (MG/L) (00620)	TOTAL NITRITE (N) (MG/L) (00615)	TOTAL AMMONIA NITRO- GEN (N) (MG/L) (00610)	TOTAL ORGANIC NITRO- GEN (N) (MG/L) (00605)	TOTAL NITRO- GEN (N) (MG/L) (00600)	TOTAL ORTHO PHOS- PHORUS (P) (MG/L) (70507)	TOTAL PHOS- PHORUS (P) (MG/L) (00665)	DIS- SOLVED PO- TAS- SIUM (K) (MG/L) (00935)	DIS- SOLVED SILICA (SiO2) (MG/L) (00955)	DIS- SOLVED SODIUM (NA) (MG/L) (00930)
AUG . 1971										
10...	--	--	--	--	--	--	--	1.8	8.2	44
10...	--	--	--	--	--	--	--	--	--	--
SEP										
09...	.00	.00	12	.00	12	.00	.03	66	14	4120
09...	--	--	--	--	--	--	--	--	--	--
AUG . 1975										
21...	.00	.00	4.1	1.0	5.1	.00	.01	39	14	2100
SEP										
16...	.00	.01	4.1	.28	4.3	.00	.02	--	--	--
OCT										
16...	.00	.00	3.9	.10	4.0	.00	.01	--	--	--
NOV										
19...	.02	.01	4.6	.25	4.8	.01	.02	--	--	--
DEC										
15	.04	.02	4.2	.45	4.7	.02	.04	--	--	--
JAN . 1976										
21...	.04	.02	4.3	.85	5.2	.01	.02	38	13	2000
FEB										
26...	.00	.01	4.4	1.8	6.2	.01	.01	--	--	--
MAR										
20...	.00	.00	4.8	3.6	8.4	.00	.01	--	--	--
APR										
28...	.00	.00	4.9	5.1	10	.01	.02	35	16	1900
MAY										
13...	.00	.00	5.0	12	17	.02	.04	33	18	1700
13...	.00	.00	4.8	12	16	.01	.02	--	--	--
13...	.00	.00	4.6	7.7	12	.01	.02	--	--	--
13...	.00	.00	4.7	7.4	12	.01	.01	36	16	1800
JUN										
24...	.01	.00	4.5	12	16	.02	.03	--	--	--
JUL										
21...	.00	.00	4.5	14	18	.01	.01	32	18	1700
AUG										
19...	.00	.00	4.7	15	19	.02	.03	--	--	--
SEP										
16...	.00	.01	4.6	16	20	.04	.06	--	--	--
OCT										
19...	.00	.01	4.6	18	22	.05	.05	--	--	--
NOV										
16...	.01	.00	4.9	15	19	.03	.03	--	--	--

Table 3.--Chemical analyses of water from the deep-test monitor well, August 1971 - June 1977--Continued

DATE	DIS- SOLVED STRON- TIUM (ST) (JG/L) (01080)	TUR- BID- ITY (JTU) (00070)	DIS- SOLVED ALUM- INUM (AL) (UG/L) (01106)	DIS- SOLVED ARSENIC (AS) (UG/L) (01000)	DIS- SOLVED BORON (B) (UG/L) (01020)	DIS- SOLVED CAD- MIUM (CD) (UG/L) (01025)	DIS- SOLVED CHRO- MIUM (CR) (UG/L) (01030)	HEXA- VALENT CHRO- MIUM (CR6) (UG/L) (01032)	DIS- SOLVED COBALT (CO) (UG/L) (01035)	DIS- SOLVED COPPER (CU) (UG/L) (01040)
AUG . 1971										
10...	--	--	--	--	360	--	--	--	--	0
10...	220	--	--	0	--	--	--	0	--	--
SEP										
09...	--	--	--	10	4400	--	0	0	--	0
09...	--	--	--	10	--	--	--	0	--	--
AUG . 1975										
21...	5000	50	--	4	710	0	0	0	0	0
SEP										
16...	--	25	--	--	--	--	--	--	--	--
OCT										
16...	--	30	--	--	--	--	--	--	--	--
NOV										
19...	--	35	--	--	--	--	--	--	--	--
DEC										
15...	--	30	--	--	--	--	--	--	--	--
JAN . 1976										
21...	4300	35	10	4	2500	0	0	0	0	0
FEB										
26...	--	25	--	--	--	--	--	--	--	--
MAR										
20...	--	25	--	--	--	--	--	--	--	--
APR										
28...	4300	25	0	12	2400	1	0	0	0	0
MAY										
13...	2900	35	30	14	1200	0	0	0	0	0
13...	--	25	--	--	--	--	--	--	--	--
13...	--	20	--	--	--	--	--	--	--	--
13...	3700	20	20	9	1500	0	0	0	0	0
JUN										
24...	--	40	--	--	--	--	--	--	--	--
JUL										
21...	3400	30	--	22	1400	--	--	--	--	0
AUG										
19...	--	25	--	--	--	--	--	--	--	--
SEP										
16...	--	25	--	--	--	--	--	--	--	--
OCT										
19...	--	35	--	--	--	--	--	--	--	--
NOV										
16...	--	20	--	--	--	--	--	--	--	--

Table 3.—Chemical analyses of water from the deep-test monitor well, August 1971 - June 1977-Continued

DATE	DIS- SOLVED IRON (FE) (UG/L) (01046)	DIS- SOLVED LEAD (PB) (UG/L) (01049)	DIS- SOLVED LITHIUM (LI) (UG/L) (01130)	DIS- SOLVED MANGANESE (MN) (UG/L) (01056)	DIS- SOLVED MERCURY (HG) (UG/L) (71890)	DIS- SOLVED MOLYB- DENUM (MO) (UG/L) (01060)	DIS- SOLVED NICKEL (NI) (UG/L) (01065)	DIS- SOLVED VANAD- IUM (V) (UG/L) (01085)	DIS- SOLVED ZINC (ZN) (UG/L) (01090)
AUG , 1971									
10...	--	0	--	--	--	--	--	--	20
10...	--	--	--	--	--	--	--	--	--
SEP									
09...	2300	0	--	40	1.0	--	--	--	30
09...	--	--	--	--	--	--	--	--	--
AUG , 1975									
21...	2400	1	--	50	.3	--	--	--	10
SEP									
16...	--	--	--	--	--	--	--	--	--
OCT									
16...	--	--	--	--	--	--	--	--	--
NOV									
12...	--	--	--	--	--	--	--	--	--
DEC									
15...	--	--	--	--	--	--	--	--	--
JAN , 1976									
21...	2400	2	--	30	.0	--	--	--	20
FEB									
26...	--	--	--	--	--	--	--	--	--
MAR									
20...	--	--	--	--	--	--	--	--	--
APR									
28...	710	7	--	20	.0	--	--	--	0
MAY									
13...	2000	7	--	50	.3	--	--	--	10
3...	--	--	--	--	--	--	--	--	--
13...	--	--	--	--	--	--	--	--	--
13...	1000	5	--	40	.2	--	--	--	0
JUN									
24...	--	--	--	--	--	--	--	--	--
JUL									
21...	930	--	--	--	--	--	--	--	10
AUG									
10...	--	--	--	--	--	--	--	--	--
SEP									
16...	--	--	--	--	--	--	--	--	--
OCT									
19...	--	--	--	--	--	--	--	--	--
NOV									
16...	--	--	--	--	--	--	--	--	--

Table 3.--Chemical analyses of water from the deep-test monitor well, August 1971 - June 1977-Continued

DATE	TIME	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS) (00095)	PH (UNITS) (00400)	TEMPER- ATURE (DEG C) (00010)	BICAR- BONATE (HCO3) (MG/L) (00440)	CAR- BONATE (CO3) (MG/L) (00445)	TOTAL ACIDITY AS H+ (MG/L) (71825)	ALKA- LINITY AS CACO3 (MG/L) (00410)	DIS- SOLVED CAL- CIUM (CA) (MG/L) (00915)	DIS- SOL- VED ORGANIC CARBON (C) (MG/L) (00681)
DEC . 1976										
14...	1500	7000	7.5	24.0	1270	0	--	1040	22	47
JAN . 1977										
17...	1330	7100	7.7	24.0	1350	0	.0	1110	22	68
FEB										
21...	1400	6450	7.9	24.5	1440	0	--	1180	20	67
MAR										
20...	0955	--	--	--	--	--	--	--	--	--
24...	0900	6550	7.8	24.5	1500	0	--	1230	21	63
APR										
26...	1010	6500	7.9	25.0	1550	0	--	1270	16	61
MAY										
18...	1315	6900	8.1	25.5	1580	0	--	1300	18	--
JUN										
13...	1630	7500	7.9	25.0	1500	0	--	1230	25	--

Table 3.--Chemical analyses of water from the deep-test monitor well, August 1971 - June 1977-Continued

DATE	CHEM- ICAL OXYGEN DEMAND (HIGH LEVEL) (MG/L) (00340)	DIS- SOLVED CHLO- RIDE (CL) (MG/L) (00940)	COLOR (PLAT- INUM- COBALT UNITS) (00080)	CYANIDE (CN) (MG/L) (00720)	DIS- SOLVED SOLIDS (RESI- DUE AT 180 C) (MG/L) (70300)	DIS- SOLVED FLUO- RIDE (F) (MG/L) (00950)	HARD- NESS (CA, MG) (MG/L) (00900)	NON- CAR- BONATE HARD- NESS (MG/L) (00902)	DIS- SOLVED MAG- NE- SIUM (MG) (MG/L) (00925)	DIS- SOLVED SULFATE (SO4) (MG/L) (00945)
DEC . 1976										
14...	220	1400	--	---	--	4.7	150	0	24	470
JAN , 1977										
17...	240	1400	50	21	--	5.5	160	0	25	550
FEB										
21...	--	1100	--	--	--	5.0	150	0	23	750
MAR										
09...	--	--	--	.01	--	--	--	--	--	--
24...	260	1100	--	--	--	4.8	160	0	27	560
APR										
20...	257	950	100	.01	4130	5.2	140	0	24	500
MAY										
18...	254	1100	--	--	--	6.5	150	0	25	500
JUN										
15...	264	1300	--	--	--	5.2	190	0	31	420

Table 3.--Chemical analyses of water from the deep-test monitor well, August 1971 - June 1977-Continued

DATE	TOTAL NITRATE (N) (MG/L) (00620)	TOTAL NITRITE (N) (MG/L) (00615)	TOTAL AMMONIA NITRO- GEN (N) (MG/L) (00610)	TOTAL ORGANIC NITRO- GEN (N) (MG/L) (00605)	TOTAL NITRO- GEN (N) (MG/L) (00600)	TOTAL ORTHO PHOS- PHORUS (P) (MG/L) (70507)	TOTAL PHOS- PHORUS (P) (MG/L) (00665)	DIS- SOLVED PO- TAS- SIUM (K) (MG/L) (00935)	DIS- SOLVED SILICA (SiO2) (MG/L) (00955)	DIS- SOLVED SODIUM (NA) (MG/L) (00930)
DEC , 1976										
14...	.00	.00	5.4	19	24	.01	.01	--	--	--
JAN , 1977										
17...	.01	.00	6.3	21	27	.03	.05	36	18	1600
FEB										
21...	.00	.01	10	27	37	.03	.05	--	--	--
MAR										
09 ..	--	--	--	--	--	--	--	--	--	--
24...	.00	.01	13	23	36	.03	.03	--	--	--
APR										
20...	.00	.00	17	23	40	.02	.05	37	19	1500
MAY										
18...	.00	.00	22	27	49	.01	.04	--	--	--
JUN										
13...	.00	.00	22	19	41	.01	.04	--	--	--

Table 3.--Chemical analyses of water from the deep-test monitor well, August 1971 - June 1977-Continued

DATE	DIS- SOLVED STRON- TIUM (SR) (UG/L) (01080)	TUP- BIL- ITY (JYU) (00070)	DIS- SOLVED ALUM- INUM (AL) (UG/L) (01106)	DIS- SOLVED ARSENIC (AS) (UG/L) (01000)	DIS- SOLVED BORON (B) (UG/L) (01020)	DIS- SOLVED CAD- MIUM (CD) (UG/L) (01025)	DIS- SOLVED CHRO- MIUM (CR) (UG/L) (01030)	HEXA- VALENT CHRO- MIUM (CR6) (UG/L) (01032)	DIS- SOLVED COBALT (CO) (UG/L) (01035)	DIS- SOLVED COPPER (CU) (UG/L) (01040)
DEC , 1976										
14...	--	25	--	--	--	--	--	--	--	--
JAN , 1977										
17...	3000	20	--	15	2600	--	--	--	--	0
FEB										
21...	--	30	--	--	--	--	--	--	--	--
MAR										
09...	--	--	--	--	--	--	--	--	--	--
24...	--	25	--	--	--	--	--	--	--	--
APR										
21...	3000	9	--	--	--	--	--	--	--	--
MAY										
18...	--	30	--	--	--	--	--	--	--	--
JUN										
13...	--	30	--	--	--	--	--	--	--	--

Table 3.--Chemical analyses of water from the deep-test monitor well, August 1971 - June 1977--Continued

DATE	DIS- SOLVED IRON (FE) (UG/L) (01046)	DIS- SOLVED LEAD (PB) (UG/L) (01049)	DIS- SOLVED LITHIUM (LI) (UG/L) (01130)	DIS- SOLVED MAN- GANESE (MN) (UG/L) (01056)	DIS- SOLVED MERCURY (HG) (UG/L) (71890)	DIS- SOLVED MOLYB- DENUM (MO) (UG/L) (01060)	DIS- SOLVED NICKEL (NI) (UG/L) (01065)	DIS- SOLVED VANA- DIUM (V) (UG/L) (01085)	DIS- SOLVED ZINC (ZN) (UG/L) (01090)
DEC , 1976									
14...	--	--	--	--	--	--	--	--	--
JAN , 1977									
17...	1600	--	--	--	--	--	--	--	0
FEB									
21...	--	--	--	--	--	--	--	--	--
MAR									
09...	--	--	--	--	--	--	--	--	--
24...	--	--	--	--	--	--	--	--	--
APR									
20...	--	--	--	--	--	--	--	--	--
MAY									
18...	--	--	--	--	--	--	--	--	--
JUN									
13...	--	--	--	--	--	--	--	--	--

Table 4.--Chemical analyses of water from the deep-monitor well-north, May 1975 - June 1977.

DATE	TIME	SPE- CIFIC CON- DUCT- ANCE (MICR- MHOS) (00095)	PH (UNITS) (00400)	TEMPER- ATURE (DEG C) (00010)	BICAR- BONATE (HCO3) (MG/L) (00440)	CAR- BONATE (CO3) (MG/L) (00445)	TOTAL ACIDITY AS H+ (MG/L) (71825)	ALKA- LINITY AS CACO3 (MG/L) (00410)	DIS- SOLVED CAL- CIUM (CA) (MG/L) (00915)	DIS- SOL- VED ORGANIC CARBON (C) (MG/L) (00681)
MAY, 1975										
14...	1400	10000	8.0	--	368	0	--	302	80	--
20...	1300	10700	8.5	27.0	367	0	--	301	70	.0
20...	1330	13000	8.3	--	320	0	--	262	110	.0
20...	1400	9000	8.4	29.0	386	0	--	317	60	1.0
JUL										
14...	1430	7000	7.7	23.0	413	0	.2	339	32	1.0
AUG										
21...	1435	6400	7.9	23.0	416	0	--	341	22	.0
SEP										
17...	0940	5900	7.8	23.0	418	0	--	343	21	.0
OCT										
16...	0950	5900	7.9	23.0	416	0	--	341	20	.0
NOV										
19...	1105	6510	7.8	23.0	421	0	--	345	21	1.0
DEC										
17...	0950	5850	7.8	23.0	424	0	--	346	21	1.0
JAN, 1976										
20...	1620	6000	7.8	23.0	428	0	.2	351	25	1.0
FEB										
26...	1320	6200	7.8	23.0	432	0	--	354	22	1.0
MAR										
21...	0900	5950	7.8	23.0	448	0	--	367	21	2.0
APR										
27...	1715	6500	7.8	23.5	434	0	--	356	22	.0
MAY										
9...	0900	6100	7.8	23.5	435	0	--	357	19	2.0
JUN										
24...	1310	6800	7.9	23.5	444	0	--	364	22	2.0
JUL										
20...	1415	5900	7.8	24.0	446	0	.2	366	20	.0
AUG										
19...	1030	6500	7.8	24.0	446	0	--	366	19	1.0
SEP										
15...	1040	6800	7.7	24.0	436	0	--	358	26	.0
OCT										
19...	1005	6300	7.8	24.0	441	0	--	362	22	.0
NOV										
16...	1010	6450	7.8	24.0	441	0	--	362	23	--
DEC										
14...	1245	6400	7.8	24.0	442	0	--	363	24	1.0

Table 4.- Chemical analyses of water from the deep-monitor well-north, May 1975 - June 1977-Continued

DATE	CHEM- ICAL OXYGEN DEMAND (HIGH LEVEL) (MG/L) (00340)	DIS- SOLVED CHLOR- IDE (CL) (MG/L) (00940)	COLOR (PLAT- INUM- COBALT UNITS) (00080)	CYANIDE (CN) (MG/L) (00720)	DIS- SOLVED SOLIDS (RESI- DUE AT 180 C) (MG/L) (70300)	DIS- SOLVED FLUO- RIDE (F) (MG/L) (00950)	HARD- NESS (CA.MG) (MG/L) (00900)	NON- CAR- BONATE HARD- NESS (MG/L) (00902)	DIS- SOLVED MAG- NE- SIUM (MG) (MG/L) (00925)	DIS- SOLVED SULFATE (SO4) (MG/L) (00945)
MAY , 1975										
14...	--	3100	0	--	5540	4.1	430	130	52	8.0
20...	--	3200	0	--	5690	4.1	410	110	54	4.0
20...	--	4300	0	--	7530	3.7	620	360	80	.4
20...	47	3000	20	--	5290	4.2	370	56	52	.4
JUL										
14...	--	2200	5	.01	4120	4.0	200	0	28	--
AUG										
21...	--	2200	--	--	--	3.9	140	0	21	--
SEP										
17...	--	1900	--	--	--	4.0	140	0	21	--
OCT										
13...	--	1900	--	--	--	4.0	140	0	21	--
NOV										
19...	--	1900	--	--	--	4.1	140	0	20	--
DEC										
17...	--	1900	--	--	--	3.9	140	0	20	--
JAN , 1976										
20...	96	1900	0	.00	3500	3.5	150	0	21	29
FEB										
26...	--	1900	--	--	--	4.3	130	0	19	--
MAR										
21...	--	1900	--	--	--	4.2	130	0	19	--
APR										
27...	--	2100	--	--	--	4.2	150	0	22	--
MAY										
19...	--	1900	--	--	--	3.9	140	0	22	--
JUN										
24...	--	1900	--	--	--	3.8	140	0	21	6.2
JUL										
20...	470	1900	5	.00	3448	1.9	140	0	22	5.0
AUG										
15...	--	1900	--	--	--	3.8	130	0	19	2.4
SEP										
15...	--	2000	--	--	--	4.1	170	0	25	11
OCT										
19...	61	1900	--	--	--	3.8	150	0	22	--
NOV										
16...	61	1900	--	--	--	3.9	140	0	21	.0
DEC										
14...	--	1900	--	--	--	3.9	150	0	22	4.0

Table 4.--Chemical analyses of water from the deep-monitor well-north, May 1975 - June 1977-Continued

DATE	TOTAL NITRATE (N) (MG/L) (00620)	TOTAL NITRITE (N) (MG/L) (00615)	TOTAL AMMONIA NITRO- GEN (N) (MG/L) (00610)	TOTAL ORGANIC NITRO- GEN (N) (MG/L) (00605)	TOTAL NITRO- GEN (N) (MG/L) (00600)	TOTAL ORTHO PHOS- PHORUS (P) (MG/L) (70507)	TOTAL PHOS- PHORUS (P) (MG/L) (00665)	DIS- SOLVED PO- TAS- SIUM (K) (MG/L) (00935)	DIS- SOLVED SILICA (SI02) (MG/L) (00955)	DIS- SOLVED SODIUM (NA) (MG/L) (00930)
MAY , 1975										
14....	--	--	--	--	--	--	--	38	19	1980
20....	.00	.01	3.6	.10	3.7	.00	.01	41	17	2020
20....	.00	.01	4.8	.70	5.5	.00	.01	48	18	2600
20....	.00	.01	3.8	.50	4.3	.00	.02	38	17	1970
JUL										
14....	.00	.00	3.1	.50	3.6	.00	.01	27	18	1500
AUG										
21....	.00	.00	2.5	.40	2.9	.02	.02	--	--	--
SEP										
17....	.00	.00	2.8	.14	2.9	.02	.02	--	--	--
OCT										
16....	.00	.00	2.6	.28	2.8	.02	.02	--	--	--
NOV										
19....	.02	.01	2.9	.22	3.1	.02	.02	--	--	--
DEC										
17....	.03	.02	2.7	.12	2.8	.03	.03	--	--	--
JAN , 1976										
20....	.01	.01	2.8	.16	2.9	.02	.02	25	18	1400
FEB										
26....	.00	.00	2.7	.16	2.8	.02	.02	--	--	--
MAR										
21....	.00	.00	2.8	.04	2.8	.02	.02	--	--	--
APR										
27....	.00	.00	3.1	.10	3.2	.02	.02	--	--	--
MAY										
19....	.00	.00	2.9	.06	3.0	.03	.03	--	--	--
JUN										
24....	.00	.00	2.7	.17	2.8	.03	.03	--	--	--
JUL										
20....	.00	.00	2.7	.00	2.7	.02	.02	27	19	1350
AUG										
19....	.00	.00	2.8	.00	2.7	.02	.04	--	--	--
SEP										
15....	.00	.01	2.9	.07	2.9	.01	.02	--	--	--
OCT										
19....	.00	.00	2.7	.30	3.0	.04	.04	--	--	--
NOV										
16....	.00	--	2.7	.00	--	.02	.02	--	--	--
DEC										
14....	.00	.00	2.7	.12	2.8	.01	.01	--	--	--

Table 4.--Chemical analyses of water from the deep-monitor well-north, May 1975 - June 1977-Continued

DATE	DIS- SOLVED STRON- TIUM (SR) (UG/L) (01080)	TUR- BIO- IDITY (JTU) (00070)	DIS- SOLVED ALUM- INUM (AL) (UG/L) (01106)	DIS- SOLVED ARSENIC (AS) (UG/L) (01000)	DIS- SOLVED BORON (B) (UG/L) (01020)	DIS- SOLVED CAD- MIUM (CD) (UG/L) (01025)	DIS- SOLVED CHRO- MIUM (CR) (UG/L) (01030)	HEXA- VALENT CHRO- MIUM (CR6) (UG/L) (01032)	DIS- SOLVED COBALT (CO) (UG/L) (01035)	DIS- SOLVED COPPER (CU) (UG/L) (01040)
MAY , 1975										
14...	12000	--	100	9	1700	0	2	0	0	4
20...	8800	40	--	--	--	--	--	--	--	--
20...	14000	150	--	--	--	--	--	--	--	--
20...	8000	35	0	9	2300	0	0	0	0	0
JUL										
14...	2800	10	10	8	380	0	0	0	1	0
AUG										
21...	--	5	--	--	--	--	--	--	--	--
SEP										
17...	--	7	--	--	--	--	--	--	--	--
OCT										
16...	--	4	--	--	--	--	--	--	--	--
NOV										
19...	--	3	--	--	--	--	--	--	--	--
DEC										
17...	--	4	--	--	--	--	--	--	--	--
JAN , 1976										
20...	3300	5	20	5	2100	0	0	0	0	0
FEB										
26...	--	4	--	--	--	--	--	--	--	--
MAR										
21...	--	3	--	--	--	--	--	--	--	--
APR										
27...	--	3	--	--	--	--	--	--	--	--
MAY										
19...	--	3	--	--	--	--	--	--	--	--
JUN										
24...	--	3	--	--	--	--	--	--	--	--
JUL										
20...	3100	2	--	7	--	--	--	--	--	11
AUG										
19...	--	2	--	--	--	--	--	--	--	--
SEP										
15...	--	2	--	--	--	--	--	--	--	--
OCT										
19...	--	1	--	--	--	--	--	--	--	--
NOV										
10...	--	1	--	--	--	--	--	--	--	--
DEC										
14...	--	2	--	--	--	--	--	--	--	--

Table 4.--Chemical analyses of water from the deep-monitor well-north, May 1975 - June 1977-Continued

DATE	DIS- SOLVED IRON (FE) (UG/L) (01046)	DIS- SOLVED LEAD (PB) (UG/L) (01049)	DIS- SOLVED LITHIUM (LI) (UG/L) (01130)	DIS- SOLVED MANGANESE (MN) (UG/L) (01056)	DIS- SOLVED MERCURY (HG) (UG/L) (71890)	DIS- SOLVED MOLYB- DENUM (MO) (UG/L) (01060)	DIS- SOLVED NICKEL (NI) (UG/L) (01065)	DIS- SOLVED VANAD- IUM (V) (UG/L) (01085)	DIS- SOLVED ZINC (ZN) (UG/L) (01090)
MAY , 1975									
14...	1000	12	140	10	.2	0	0	99	50
20...	20	--	--	--	--	--	--	--	--
20...	20	--	--	--	--	--	--	--	--
20...	1000	0	130	20	.1	0	0	100	10
JUL									
14...	210	10	--	6	.2	--	--	--	10
AUG									
21...	--	--	--	--	--	--	--	--	--
SEP									
17...	--	--	--	--	--	--	--	--	--
OCT									
16...	--	--	--	--	--	--	--	--	--
NOV									
19...	--	--	--	--	--	--	--	--	--
DEC									
17...	--	--	--	--	--	--	--	--	--
JAN , 1976									
20...	100	0	--	10	.2	--	--	--	20
FEB									
26...	--	--	--	--	--	--	--	--	--
MAR									
21...	--	--	--	--	--	--	--	--	--
APR									
27...	--	--	--	--	--	--	--	--	--
MAY									
19...	--	--	--	--	--	--	--	--	--
JUN									
24...	--	--	--	--	--	--	--	--	--
JUL									
20...	130	--	--	--	--	--	--	--	0
AUG									
19...	--	--	--	--	--	--	--	--	--
SEP									
15...	--	--	--	--	--	--	--	--	--
OCT									
19...	--	--	--	--	--	--	--	--	--
NOV									
16...	--	--	--	--	--	--	--	--	--
DEC									
14...	--	--	--	--	--	--	--	--	--

Table 4.--Chemical analyses of water from the deep-monitor well-north, May 1975 - June 1977-Continued

DATE	TIME	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS) (00095)	PH (UNITS) (00400)	TEMPER- ATURE (DEG C) (00010)	BICAR- BONATE (HCO3) (MG/L) (00440)	CAR- BONATE (CO3) (MG/L) (00445)	TOTAL ACIDITY AS H+ (MG/L) (71825)	ALKA- LILITY AS CACO3 (MG/L) (00410)	DIS- SOLVED CAL- CIUM (CA) (MG/L) (00915)	DIS- SOL- VED ORGANIC CARBON (C) (MG/L) (00681)
JAN . 1977										
18...	1350	7400	7.5	26.0	409	0	.0	335	33	1.0
FEB										
23...	0920	6500	7.9	24.0	444	0	--	364	23	.0
MAR										
24...	1440	6500	7.7	24.0	438	0	--	359	24	1.0
APR										
20...	1440	6100	7.5	24.0	436	0	--	358	23	1.0
MAY										
19...	1340	6900	7.8	24.0	438	0	--	359	23	--
JUN										
14...	0930	7350	7.8	25.0	442	0	--	363	26	--

Table 4.--Chemical analyses of water from the deep-monitor well-north, May 1975 - June 1977--Continued

DATE	CHEMICAL OXYGEN DEMAND (HIGH LEVEL) (MG/L) (00040)	DIS- SOLVED CHLORIDE (CL) (MG/L) (00940)	COLOR (PLAT- INUM- COBALT UNITS) (00080)	CYANIDE (CN) (MG/L) (00720)	DIS- SOLVED SOLIDS (RESI- DUE AT 180 C) (MG/L) (70300)	DIS- SOLVED FLUORIDE (F) (MG/L) (00950)	HARD- NESS (CA.MG) (MG/L) (00900)	NON- CAR- BONATE HARD- NESS (MG/L) (00902)	DIS- SOLVED MAG- NE- SIUM (MG) (MG/L) (00925)	DIS- SOLVED SULFATE (SO4) (MG/L) (00945)
JAN , 1977										
18...	110	2300	10	.00	4130	4.0	200	0	34	7.0
FEB										
23...	--	1900	--	--	--	4.2	140	0	21	3.5
MAR										
24...	--	1900	--	--	--	3.8	150	0	22	2.0
APR										
20...	46	2000	5	.00	3450	4.0	150	0	22	9.2
MAY										
19...	101	1900	--	--	--	4.4	140	0	21	1.0
JUN										
14...	76	1900	--	--	--	4.2	160	0	22	1.4

Table 4.--Chemical analyses of water from the deep-monitor well-north, May 1975 - June 1977-Continued

DATE	TOTAL NITRATE (N) (MG/L) (00620)	TOTAL NITRITE (N) (MG/L) (00615)	TOTAL AMMONIA NITRO- GEN (N) (MG/L) (00610)	TOTAL ORGANIC NITRO- GEN (N) (MG/L) (00605)	TOTAL NITRO- GEN (N) (MG/L) (00600)	TOTAL ORTHO PHOS- PHORUS (P) (MG/L) (70507)	TOTAL PHOS- PHORUS (P) (MG/L) (00665)	DIS- SOLVED PO- TAS- SIUM (K) (MG/L) (00935)	DIS- SOLVED SILICA (SiO2) (MG/L) (00955)	DIS- SOLVED SODIUM (NA) (MG/L) (00930)
JAN . 1977										
18...	.00	.00	3.1	.00	3.1	.01	.02	38	19	1600
FEB										
23...	.00	.00	2.8	.10	2.9	.02	.02	--	--	--
MAR										
24...	.00	.01	2.7	.10	2.8	.02	.02	--	--	--
APR										
29...	.00	.00	2.8	.19	2.9	.02	.02	26	20	1300
MAY										
19...	.00	.00	2.7	.08	2.7	.01	.01	--	--	--
JUN										
14...	.00	.00	3.0	.00	3.0	.01	.02	--	--	--

Table 4.—Chemical analyses of water from the deep-monitor well-north, May 1975 - June 1977-Continued

DATE	DIS- SOLVED STRON- TIUM (SR) (UG/L) (01080)	TUR- BID- ITY (JTU) (00070)	DIS- SOLVED ALUM- INUM (AL) (UG/L) (01106)	DIS- SOLVED ARSENIC (AS) (UG/L) (01000)	DIS- SOLVED BORON (B) (UG/L) (01020)	DIS- SOLVED CAD- MIUM (CD) (UG/L) (01025)	DIS- SOLVED CHRO- MIUM (CR) (UG/L) (01030)	HEXA- VALENT CHRO- MIUM (CR6) (UG/L) (01032)	DIS- SOLVED COBALT (CO) (UG/L) (01035)	DIS- SOLVED COPPER (CU) (UG/L) (01040)
JAN . 1977										
18...	5000	2	--	5	2700	--	--	--	--	0
FEB										
23...	--	2	--	--	--	--	--	--	--	--
MAR										
24...	--	2	--	--	--	--	--	--	--	--
APR										
20...	3700	2	--	--	--	--	--	--	--	--
MAY										
19...	--	1	--	--	--	--	--	--	--	--
JUN										
14...	--	1	--	--	--	--	--	--	--	--

Table 4.--Chemical analyses of water from the deep-monitor well-north, May 1975 - June 1977-Continued

DATE	DIS- SOLVED IRON (FE) (UG/L) (01046)	DIS- SOLVED LEAD (PB) (UG/L) (01049)	DIS- SOLVED LITHIUM (LI) (UG/L) (01130)	DIS- SOLVED MAN- GANESE (MN) (UG/L) (01056)	DIS- SOLVED MERCURY (HG) (UG/L) (71890)	DIS- SOLVED MOLYB- DENUM (MO) (UG/L) (01060)	DIS- SOLVED NICKEL (NI) (UG/L) (01065)	DIS- SOLVED VANA- DIUM (V) (UG/L) (01085)	DIS- SOLVED ZINC (ZN) (UG/L) (01090)
JAN , 1977									
18...	160	--	--	--	--	--	--	--	0
FEB									
23...	--	--	--	--	--	--	--	--	--
MAR									
24...	--	--	--	--	--	--	--	--	--
APR									
20...	--	--	--	--	--	--	--	--	--
MAY									
19...	--	--	--	--	--	--	--	--	--
JUN									
14...	--	--	--	--	--	--	--	--	--

In water from the standby injection well, bicarbonate concentrations increased to 656 mg/L June 1977 (table 2), about 330 mg/L above background. Since August 1976, bicarbonate has ranged from 367 mg/L in September 1976 to 660 mg/L in May 1977. Dissolved organic carbon also increased over background to 3.0 mg/L in August 1976 and since has increased to as high as 11 mg/L in January 1977. Total organic nitrogen and total nitrogen also increased; total organic nitrogen from 0.27 mg/L in August 1976 to 6.0 mg/L in June 1977 and total nitrogen from 6.4 mg/L to 12 mg/L. Sulfate concentration ranged from 5.0 mg/L in June 1976 to 172 mg/L in May 1977.

Dissolved gas concentrations in water samples collected at the three deep monitor wells are as follows:

<u>Well name</u>	<u>Date</u>	<u>Time</u>	<u>Nitrogen (mg/L)</u>	<u>Oxygen (mg/L)</u>	<u>Methane (mg/L)</u>	<u>Carbon Dioxide (mg/L)</u>
Deep-test monitor well	5/13/76	1125	121	0.4	7.3	20
	5/13/76	1615	93	0.5	8.4	15
	8/19/76	1519	97	0.1	5.4	31
	4/19/77	1415	82	<.05	4.5	7.8
	4/20/77	1010	176	<.02	5.2	44
Standby injection well	4/20/77	1215	41	<.03	11.4	30
Deep-monitor well north	8/18/76	1000	19	0.1	5.8	7.7
	4/20/77	1440	20	<.05	7.4	11.4

In April 1977 a special investigation was made to determine the changes in chemical quality of the injected waste liquid that are related to microbial activity in the limestone receiving aquifer yielded positive results. During this investigation, water samples were collected and were analyzed for denitrifying bacteria. The most probable number of denitrifying bacteria in waste samples ranged from less than 2 colonies per 100 mL (milliliter) at the deep-monitor well-north to 17 colonies per 100 mL at both the deep-test monitor and standby injection wells.

Water samples collected from the deep-monitor well-north, the standby injection well, and the deep-test monitor well in April 1977 showed organic carbon concentrations of 2, 10, and 77 mg/L, but showed no positive concentrations of acetone, ethanol, and acrylonitrile at a sensitivity level of 0.2 mg/L.

Continued observation of the hydraulic and biochemical effects and geochemical changes in the lead edge of the waste body as it passes through the monitoring sites will help determine not only the ultimate quantity of waste that can be injected but also the ultimate fate of the waste as it moves within the injection zone.

SUMMARY

Hydraulic and geochemical effects of the waste-injection system at the American Cyanamid Co.'s plant as of June 30, 1977 have been detected only in the injection zone, the lower limestone of the Floridan aquifer. Increased pressures are evident at the three wells used to monitor the injection zone. Increases in concentrations of bicarbonate, dissolved organic carbon, total organic nitrogen, total nitrogen, and sulfate have been detected at the deep-test monitor well and at the standby injection well.

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